

DOCUMENT RESUME

ED 178 475

SP 014 416

AUTHOR Ward, Beatrice A.; And Others
TITLE The Effects of an Independent Learning System on Student Achievement and Attitudes. Volume I: Final Research Report.
INSTITUTION Far West Lab. for Educational Research and Development, San Francisco, Calif.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
REPORT NO A77-8
PUB DATE Sep 77
CONTRACT NE-C-00-3-0108
NOTE 375p.; For related documents, see SP 014 412 and SP 014 847; Contains some small print

EDRS PRICE MF01/PC15 Plus Postage.
DESCRIPTORS *Academic Achievement; Educational Innovation; Experimental Teaching; *Independent Study; *Individualized Instruction; Microteaching; Research Utilization; Student Attitudes; *Teacher Education; *Teaching Methods; Teaching Skills; Training Techniques

ABSTRACT

The overall purpose of the Independent Learning Study was to investigate the effects upon student outcomes of training teachers in the use of an innovative instructional system. The Independent Learning System, based on "Minicourse 15: Organizing Independent Learning--Intermediate Level," was the instructional system studied. "Minicourse 15" is a self-contained teacher training package designed to help teachers increase the independent learning opportunities of students and was adapted from a microteaching model using videotaping for self-evaluation. The teachers received minicourse training during Phase I of this study, and then implemented independent learning systems in their classrooms. Phase II investigated the effects of independent learning on student outcomes. This report includes descriptions of the background of the study, the samples and methodology, dependent and independent variables of students and processes, and a discussion of the results. Implications for future research are examined. An abstract of the report is also included. (JD)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED178475



Effective Teacher Education Program

SCOPE OF INTEREST NOTICE

The ERIC Facility has assigned this document for processing to:

SP

TM

In our judgement, this document is also of interest to the clearinghouses noted to the right. Indexing should reflect their special points of view.

UD

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

*Far West Laboratory
for Educational
Research and
Development*

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

THE EFFECTS OF AN INDEPENDENT LEARNING SYSTEM ON STUDENT ACHIEVEMENT AND ATTITUDES

Volume I: Final Research Report

Beatrice A. Ward, Earl Mortensen
Robert Trinchero, Andrea Lash,
Morris Lai, Robert Linn,
Charles Fisher, George Stanton,
Leonard Cahen

REPORT A77-8

Far West Laboratory for
Educational Research and Development

1855 FOLSOM STREET • SAN FRANCISCO, CALIFORNIA 94103 •

SP 014416



FAR WEST LABORATORY
FOR EDUCATIONAL RESEARCH AND DEVELOPMENT

THE EFFECTS OF AN INDEPENDENT LEARNING SYSTEM
ON STUDENT ACHIEVEMENT AND ATTITUDES

Volume I: Final Research Report

Beatrice A. Ward, Earl Mortenson,
Robert Trinchero, Andrea Lash,
Morris Lai, Robert Linn,
Charles Fisher, George Stanton,
Leonard Cahen

September 1977

The work reported herein was supported by the National Institute of Education, Department of Health, Education and Welfare, Contract No. NE-C-00-3-0108. The opinions expressed in this publication do not necessarily reflect the position or policy of the National Institute of Education and no official endorsement by the National Institute of Education should be inferred.

ACKNOWLEDGEMENTS

This study of the effects of an independent learning system on student achievement and attitudes represents an ambitious, large scale research effort. Eighty-six teachers from 18 schools in the Los Angeles City Unified School District participated in the study. Training, data collection, and experimentation extended over a two year period.

This type of large scale field based research requires the cooperation and talents of many people whom we wish to acknowledge here. First, we express our appreciation to Dr. Harry Handler, Associate Superintendent of the Los Angeles City Schools. Dr. Robert Sallander, Assistant Director, Research and Evaluation Branch, provided helpful input to the research design and to the data-collection process. The superintendents, principals, teachers, and students of Areas B, D, G, H, J, and K also gave excellent cooperation in all phases of the study. We particularly want to thank Dr. Roy Ingebrigtsen, Director of Instruction. His cooperation and assistance were invaluable to the research effort.

The research design was developed by Morris Lai and Charles Fisher with additional input from Beatrice Ward and David Berliner. Others who reviewed and contributed to the design were Steven Klein of Rand Corporation; Leonard Marascuilo of the University of California at Berkeley; Barak Rosenshine of the University of Illinois, Urbana; and Samuel Messick of Educational Testing Service.

Phase I of the study was directed by Morris Lai with the assistance of Janice Sterling, Marilyn Madsen, Stephen Mills, and Kenneth Crown. Phase II was directed by Earl Mortensen with assistance from Andrea Lash and Janice Sterling. Data analysis was also under the direction of this team with further input from Beatrice Ward, Leonard Cahen, and Robert Linn.

The writing of the report is primarily the work of Beatrice Ward, Andrea Lash, Morris Lai, and Robert Linn. Editorial assistance was provided by Mary Dawson. This final document, including all graphics, was prepared by Carolyn Amable who served as secretary for this study. The research staff is particularly indebted to her for the organizational support throughout all phases of the endeavor.

Victor Cicerelli and Darryl Strickler reviewed and critiqued the report. Their suggestions have been incorporated into this final version. They did much to improve the clarity and preciseness of the document.

This study was made possible by the National Institute of Education. We wish to thank the staff of the Basic Skills Division of the Institute for their support. In particular, we want to acknowledge the helpful leadership and guidance we received from Virginia Koehler, Chief, Teaching Division, and Esther Perry, our program officer.

B.A.W.
September 1977

ABSTRACT

THE EFFECTS OF AN INDEPENDENT LEARNING SYSTEM
ON STUDENT ACHIEVEMENT AND ATTITUDES

This report presents the results of a field-based study of teachers' use of an independent learning system. The study was conducted by the staff of the Effective Teacher Education Program of the Far West Laboratory for Educational Research and Development. The study grew out of the Laboratory's earlier work in developing a series of skill-training packages for teachers called Minicourses.

Purpose

The study investigated the effects upon student outcomes of training teachers in the use of an innovative instructional system--namely, an independent learning system based on Minicourse 15: Organizing Independent Learning--Intermediate Level. During the first phase of the study, those teachers assigned to the treatment group received training in Minicourse 15; then, during the second phase, they implemented the independent learning system in their classrooms.

The research question during Phase I was:

What are the effects of Minicourse 15 training on teacher behaviors related to organizing independent learning?

The research questions investigated during Phase II, classroom implementation were:

1. Does the organization of learning activities in classrooms of teachers who have implemented an independent learning system differ from the organization in classrooms where the system has not been implemented?
2. What are the effects of the independent learning system on student outcomes as measured by traditional achievement instruments in:
 - a. social studies achievement?
 - b. work study skills?

3. What are the effects of the independent learning system on student variables directly associated with independent study:
 - a. level of independence?
 - b. quality of a student product produced independently?
4. What are the effects of the independent learning system on student affective outcomes?
 - a. attitudes toward teacher, social studies, learning, school?
 - b. self-concept?

Independent learning in social studies in grades 4, 5, and 6 was the focus of the study.

Review of the Literature

Independent study has been variously defined in the literature. Beggs and Buffie (1965) defined it as a learning situation within a school day that allows a student to develop personal competencies as an individual. Klausmeier, Morrow, and Walter (1968) described independent study as a setting in which the students work on an individual assignment without continuous interaction with or supervision by the teacher. MacDonald (1970) suggested that in independent learning, "children are engaged in a curriculum task without benefit (or hindrance) of any immediately observable interpersonal mediation." In a comprehensive survey of the literature, Gibbons (1970) found that although definitions of independent study differ, two major elements are mentioned frequently: individual study (study by one's self) and self-directed study.

The independent learning system that was implemented in the research reported here was based on a concept of independent study which emphasized (1) individualization of instruction; and (2) student participation in decision making about learning. Support for both of these elements in instructional

procedures is found widely in the literature (e.g., Bloom, 1968; Dell, 1972; Alschuler, 1968; Fisher, 1973).

Research into the effects on students of independent study has been limited and generally marked by methodological problems in studying student outcome variables in the affective domain (Kahn and Weiss, 1973; Gardner, 1967) and by inadequate specification of the teaching procedures used. A few studies have reported positive effects on students in terms of increased behavior that is self-initiated (Scanlon, 1966; Nyquist and Hawes, 1972), and some studies of open education plans have reported that students in open schools had better attitudes toward school and toward themselves (Traub, et al., 1973).

Other research, however, has called into question the effects on students of various forms of "informal," "indirect," or "open" education. For example, Rosenshine (1976) reviewed research since 1970 on instruction in reading and mathematics in the primary grades for low socioeconomic status students and concluded that "time spent by students working alone was usually negatively related to achievement." He reported that "a pattern of direct instruction, consisting of small steps at the student's level and a great deal of work mediated by either the teacher or workbooks, all of which is directed by the teacher, appear most functional."

In a similar vein, Bennett (1976) conducted a four-year study of open and traditional classrooms at the third and fourth grade levels in Great Britain. Generally he found that pupils taught formally (with structured lesson plans, fixed work schedules, a reward system) achieved significantly greater gains on standardized tests of reading, writing, and arithmetic than pupils in informal classes (with self-scheduled work, integration of subjects, no effort to curb talking or movement, no tests or grading).

The present study differs from the research reported by Rosenshine and Bennett in terms of the grade level of the students (4 through 6 as compared with earlier grades), the subject area that was investigated (social studies as compared with reading, mathematics, and/or language arts), and the "openness" of the program (the learning contracts provided a structure and sequence for learning).

Design for the Study

The study incorporated two research phases. In Phase I, teachers assigned to the treatment group received training in the use of independent learning as presented in Minicourse 15. Phase II investigated the extent to which an independent learning system was implemented in both treatment and control classes and the effects thereof.

The teachers assigned to the treatment group (originally 46) were given training in Minicourse 15 between February 6 and March 21, 1974. Training was conducted in the spring of 1974, rather than during the 1974-75 school year when the treatment teachers would implement the independent learning system, for two reasons.

First, a period of one school year was considered the minimum time required to install such a complex, new instructional strategy and observe its effects. If the training had been conducted in the fall of 1974, this condition would have been violated. Second, experience in the development and field testing of Minicourse 15 had demonstrated that teachers require two to three months after training before the contracting procedures operate smoothly. Training during the spring of 1974 thus allowed time for practice before beginning year-long operation of the instructional system. As a further measure to strengthen the treatment, teachers received retraining

in September, 1974. A detailed report on the training phase can be found in Lai and Mills (1974).

The classroom implementation phase of the study was conducted during the 1974-75 school year. Independent learning in social studies in grades 4, 5, and 6 was the focus of the study.

Pretesting of students was carried out during a four-week period beginning September 20, 1974. All posttests, as well as final independent learning projects, were completed in a six-week period beginning April 21, 1975. Although data only for target and nontarget students (see sample description) were processed for analysis, group tests were administered to all students.

In addition to pre and posttesting, classroom observations were conducted throughout the school year to determine the extent to which the prescribed independent learning system was being used in both the treatment and control classrooms.

Originally, Phase II was designed as a treatment/control study and data were collected under such a plan. However, actual observations suggested that teachers' use of independent learning was not restricted to the treatment classrooms. Thus, each classroom was categorized according to presence of treatment on a post-hoc basis and data analyses were carried out based on the extent to which independent learning was used in a classroom rather than the treatment/control designation. All classes in the study were regrouped into three categories based on the degree to which each teacher implemented an independent learning system of the type presented in Minicourse 15. These were:

- Level of Implementation 1: Non-use of the independent learning system in the classroom.

- Level of Implementation 2: Use of the independent learning system with only the six target students.
- Level of Implementation 3: Regular use of the independent learning system with 50 percent or more of the students in the class.

The results for Phase II of the study are based upon the grouping of teachers and target students by these levels of implementation.

Sample

The study was conducted in the Los Angeles City Unified School District with fourth, fifth, and sixth grade teachers. Eighty-six teachers from eighteen schools in six areas of the district volunteered with the understanding that they would be randomly assigned to one of two groups. The first group of teachers would be trained in the spring of 1974 and would implement an independent learning system in their classrooms during the 1974-75 school year. The second group would wait until the fall of 1975 to receive training and would act as a control group during the 1974-75 school year.

Since it was recognized that these volunteer teachers might differ from the general population of teachers, comparability of the study teachers and teachers in general was obtained by describing the amount of student influence in classrooms of the study teachers and of teachers in the general population.

The Dimensions of Schooling Questionnaire (DISC) was administered in the winter of 1974 to the 86 volunteer study teachers, before their assignment to treatment groups, and to a sample of 40 other teachers from the Los Angeles City Unified School District. These 40 special control teachers were selected on the basis of grade level and school. All taught grades 4-6 in schools not included in the study sample--one school from each of the six areas of the Los Angeles Unified School District containing a study school. In these six schools, all grade 4-6 teachers served as special control teachers.

The Dimensions of Schooling Questionnaire was designed to assess the openness of an instructional program or the amount of student influence in the program (Traub, Weiss, Fisher, and Musella, 1972). The range of scores for the two groups was similar--a range of 14.5 for study teachers and 12.6 for special control teachers. With the exception of the two highest scoring teachers, all the study teachers fell within the range of the special control group.

The final sample of teachers for the study consisted of 23 treatment teachers and 29 control who were then assigned to Levels of Implementation 1, 2, or 3 with 26 teachers in Level 1, 5 in Level 2, and 21 in Level 3.

The student sample for the study consisted of two groups of students who were randomly selected in each classroom. In the treatment classrooms, they were:

Target students. Six students in each class were selected and identified to the teacher as prime targets for the treatment. Treatment teachers were asked to carry out independent learning contracts in social studies with these six students regardless of the type of instructional system used with the other students.

Nontarget students. Six students were matched with the target students on the basis of sex and entry level of independence. These students were not identified to the teacher. Their involvement in independent learning contracts was dependent upon the extent to which the teacher implemented the system with the entire class. These students, therefore, served as a special within classroom control group.

In the control classes, they were:

Target students. Six students were selected in each control classroom to match as nearly as possible the same range of entry levels of independence and the same proportion of male/female students as represented by the treatment target students. Although the control target students were not specifically identified to the teachers, they received special testing and interviewing during the year and, therefore, could be identified as study participants.

Nontarget students. Six students were selected in each control class to serve as a within class control group. These students were matched with the six target students in each control classroom on the basis of sex and level of independence. The nontarget students received no special training and/or interviewing aid, therefore, were not readily identifiable as study participants by their teacher or classmates.

A total of 573 students served as the sample for the Phase II analyses. These included 8 treatment and 285 control students in Level of Implementation 1 classes, 54 treatment and 0 control students in Level 2 classes, and 188 treatment and 38 control students in Level 3 classes.

Measures

Teachers' acquisition of the skills presented by Minicourse 15 was assessed using videotapes of teachers' performance before (pre) and after (post) they received Minicourse 15 training. Retraining in the fall of 1974 was measured based on an audiotape simulation exercise on developing an independent learning contract.

Two types of student variables were of interest in the Phase II study. These were: (1) outcome variables that might be affected by participation in the treatment including cognitive, affective, and independent study related variables and (2) antecedent variables--traits and abilities--which might influence the effectiveness of the treatment. A total of six outcome variables and two antecedent variables were studied. Table I lists the variables and instruments in each category and indicates to whom and when the instruments were administered. Pretesting was conducted in late September and early October, 1974; mid-testing, in late January, 1975; posttesting, in late April and early May, 1975.

Teacher's acquisition of the skills presented by Minicourse 15 was assessed using videotapes of teachers' performance before (pre) and after (post) they

TABLE I
Phase II Study Variables and Instruments

Variable	Instrument	No. of Items	Administered to	Point of Administration		
				Pre	Mid	Post
<u>Outcome Variables</u>						
Social Studies Achievement	Social Studies Achievement Test	20	All students*	X		X
Use of Reference Materials	Work Study Skills Instrument	30	All students	X		X
Self Concept	Self-Concept Questionnaire	24	All students	X		X
Attitude toward: schooling	Student Attitude Questionnaire	12	All students	X		X
teacher		11				
learning		9				
social studies		10				
self		20				
Level of Independence	Level of Independence Interview - Part II	4	All students Target students	X	X	X
Performance on Independent Learning Task	Product Evaluation	N/A	Sample of Target students			X
<u>Antecedent Variables</u>						
Verbal Ability	Short Test of Educational Ability	40	All students	X		
Background Information	Level of Independence Interview - Part I	4	All students Target students	X	X	

* "All students" refers to all the students in classrooms of participating teachers, whether or not selected as target/nontarget study participants.

received Minicourse 15 training. Retraining in the fall of 1974 was measured based on an audiotape simulation exercise on developing an independent learning contract. Except where noted, the tests were group administered to all students in a classroom. However, for data analysis purposes, only target/nontarget student data were used.

The process variables of interest in the Phase II Study were those which described the amount of independent learning taking place in the classroom and the social climate of the classroom. Three process measures were used. Table II lists the instruments, the variables which were measured, the number of items in the measure where appropriate, and to whom and when the instrument was administered.

TABLE II
Phase II Study
Process Variables and Instruments

Variable	Instrument	No. of Items	Admin- istered to	Point of Administration		
				Pre	Mid	Post
Amount of Independent Study	Student Interview		Target students	X	X	X*
Organization and Learning Activities	Classroom Observation		All classrooms	X	X	X*
Diversity	Social Climate Questionnaire	10	All students			X
Clarity		10				
Simplicity		10				
Pace		9				

* The student interviews and classroom observations were conducted as follows: pre, September-November 1974; mid, between December 1974 and February 1975; post, between February and April 1975.

Results

As stated in Lai and Mills (1974), the findings for the teacher training phase of the study indicate that Minicourse 15 training of the teachers assigned to the treatment group resulted in substantial change in their performance in both assessing and planning skills. After training, teachers could assess students' level of independence in planning independent projects and could plan independent learning contracts at a higher skill level than they did before training. There were, however, a number of areas identified by the post training performance which warranted special attention in retraining. These were specifying how learning was to be demonstrated, establishing checkpoints, and stating learning steps. After retraining, it was judged that Minicourse 15 trained teachers could be expected to establish an independent learning system. Empirical evidence obtained during the training phase combined with a review of simulation tapes prepared during retraining indicated that the treatment group teachers were using the skills taught in Minicourse 15.

Phase II findings relative to classroom organization are presented in Table III. These findings are based on classroom observation data collected in three cycles: the first, between October 10 and December 20, 1974; the second, between January 6 and February 28, 1975; and the third, between March 3 and April 30, 1975.

The differences in the results for the high-use and non-use implementation groups, while generally not large, were consistently in the direction that would be expected for all five classroom observation items. Teachers in the high-use implementation group were less apt to be working with a large group of students, lecturing to the class, or leading a discussion than were their counterparts in the non-use group. Multiple activity groups, while common in both groups, were more likely to be found in classrooms in which 50% or more

TABLE III

Classroom Observation
Level of Significance Test of
ArcSin Transformations of Proportions

Variable	Observation			Overall
	Fall	Winter	Spring	
More than one adult in classroom ^a	.70	.73	.50	.65
Number of activity groups ^a	.50	.01	.03	.01
Student influence ^b	.26	.58	.64	.17
Number of students engaged by teacher ^b	.02	.01	.57	.01
Teacher activity ^b	.01	.01	.09	.01

^a Probabilities based on F-ratios for one-way analyses of variance.

^b Probabilities based on chi-square tests from discriminant analyses

of the students were engaged in independent learning activities than in classrooms in which no students were engaged in such activities. Level of student involvement was apt to be greater in high-use than in non-use classrooms. In general, therefore, it would seem that the classification of classrooms by level of implementation of the independent learning system resulted in groups of classrooms that differed in ways that are consistent with the intent of Minicourse 15 goals.

In addition to the observation data, interviews were conducted with target students immediately following the observations in both treatment and control

classes. Five important aspects of planning and carrying out an independent learning project were addressed by the interview questions. They were:

1. Statement of a learning objective. The student was/was not able to describe the purpose of his/her social studies project and what he/she expected to learn.
2. Consultation with teacher. The student had/had not discussed his/her learning objective with the teacher on a one-to-one basis.
3. Amount of student influence. Three categories were used to record responses to questions about student influence: (a) the student had no choice in selecting a learning objective or topic; (b) the student chose from alternatives presented by the teacher; and (c) the student suggested the topic himself/herself.
4. Statement of deadline. The student had/had not set dates when his/her work was to be completed.
5. Demonstrating learning. The student was working on an end product and was/was not able to describe how he/she would demonstrate what had been learned.

The main comparison of interest for these data is between students who were in classes at different levels of implementation. Generally, fewer students in low than in middle and high implementation classes were able to describe what they were to learn, how they would demonstrate what they learned, and when the work was to be completed. Low implementation students also had less one-to-one interaction with the teacher and less influence in selecting what would be learned than did middle and high implementation students. Only slight differences were found in the reports by middle and high implementation students about the ways in which their learning was organized. Interestingly, the proportion of target students who reported working in ways consistent with Minicourse 15 goals was slightly higher at the middle implementation level than at the high implementation level.

Inasmuch as those classes in which Minicourse 15 skills and strategies were in moderate to high use differed from the non-use classes in the types

of activities in which teachers and students engaged, it is appropriate to consider whether or not these differences in teaching/learning activities influenced student outcomes. Three types of outcomes were considered to be important: (1) learning outcomes measured by traditional types of achievement tests, (2) learning outcomes associated with the particular purposes of the independent learning system, and (3) affective outcomes.

The statistical analyses that were conducted relative to student outcomes are closely related to commonality analyses in which an attempt is made to divide the proportion of predicted variance on an outcome measure into portions that are unique to each variable and portions that are attributed jointly to each possible combination of variables.

Inasmuch as the potential number of predictor variables was quite large for the study and they naturally fell into a few broad categories, clusters of predictor variables were included in the analyses. Table IV lists the predictor variables included in each cluster for each student outcome variable.

Cluster 1 consists of student input measures. Cluster 2 consists of the "quasi-treatment" variables, that is, level of implementation and a dummy variable coded 1 for target and 0 for nontarget students. The third cluster of variables consists of interaction terms, i.e., the cross products of level of implementation and Verbal Ability or Level of Independence Pretest. The fourth cluster contains measures obtained from students at the time of the posttest which are thought to be indicative of certain classroom process variables. Since they were obtained at the end of the school year, they may be viewed as hybrid measures, i.e., indirect measures of process.

Each outcome measure was regressed, first on the variables in Cluster 1, then on those in Clusters 1 and 2, then on those in Clusters 1, 2, and 3,

TABLE IV

Clusters of Predictor Variables
Student Outcome Analyses

Outcome Variable	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Work Study Skills	Work Study Skills (Pre) Verbal Ability Level of Independence (Pre)	Level of Implementation Target/nontarget dummy	Level of Implementation X Level of Independence (Pre) Level of Implementation X Verbal Ability	Classroom Climate - Diversity - Clarity - Difficulty - Pace Level of Independence (Post)
Social Studies Achievement	Social Studies Achievement (Pre) Verbal Ability Level of Independence (Pre)	Level of Implementation Target/nontarget dummy	Level of Implementation X Level of Independence (Pre) Level of Implementation X Verbal Ability	Classroom Climate - Diversity - Clarity - Difficulty - Pace Level of Independence (Post)
Level of Independence	Level of Independence (Pre) Work Study Skills (Pre) Verbal Ability	Level of Implementation Target/nontarget dummy	Level of Implementation X Level of Independence (Pre) Level of Implementation X Verbal Ability	Classroom Climate - Diversity - Clarity - Difficulty - Pace Work Study Skills (Post)
Product Evaluation	Verbal Ability Level of Independence (Pre)	Level of Implementation Grade Level Dummy 1 Grade Level Dummy 2	Level of Implementation X Level of Independence (Pre) Level of Implementation X Verbal Ability	Classroom Climate - Diversity - Clarity - Difficulty - Pace Work Study Skills (Post) Social Studies Achievement (Post)
Self-Concept	Self Concept (Pre) Verbal Ability	Level of Implementation Target/nontarget dummy	_____	Classroom Climate - Diversity - Clarity - Difficulty - Pace
Attitude Toward Teacher	Attitude Toward Teacher (Pre) Verbal Ability	Level of Implementation Target/nontarget dummy	_____	Classroom Climate - Diversity - Clarity - Difficulty - Pace Self-Concept (Pre)
Attitude Toward Social Studies	Attitude Toward Social Studies (Pre) Verbal Ability	Level of Implementation Target/nontarget dummy	_____	Classroom Climate - Diversity - Clarity - Difficulty - Pace Self-Concept (Pre)
Attitude Toward Learning	Attitude Toward Learning (Pre) Verbal Ability	Level of Implementation Target/nontarget dummy	_____	Classroom Climate - Diversity - Clarity - Difficulty - Pace Self-Concept (Pre)
Attitude Toward School	Attitude Toward School (Pre) Verbal Ability	Level of Implementation Target/nontarget dummy	_____	Classroom Climate - Diversity - Clarity - Difficulty - Pace Self-Concept (Pre)

and finally on the variables in all four clusters combined. The increment in squared multiple correlations due to the addition of a cluster of predictor variables was then examined to identify sets of variables with potentially important influence on a given outcome measure. Standardized partial regression weights* were then examined to see the direction of the possible effect of specific variables.

Table V reports the results of the regression analyses for the two traditional achievement measures used in the study.

The squared multiple correlations and increments in squared multiple correlations for each cluster of variables are reported separately by grade. The squared multiple correlation for a given cluster includes the variables in that cluster as well as all the variables in the preceding clusters. Hence, the squared multiples necessarily are nondecreasing as one moves from Cluster 1 to 2 to 3 to 4. The increments are simply the differences between the squared multiple correlation associated with a given cluster and the squared multiple correlation associated with the preceding cluster.

For both measures, the squared multiple correlation for Cluster 1 (student input) is substantial at all three grade levels and systematically increases in magnitude as one moves from grade 4 to grade 5 to grade 6.

The increments in the squared multiple correlation due to the addition of the two "quasi-treatment" variables in Cluster 2 are small at all three grade levels. The increments at grade 4 represent a significant increase ($p \leq .05$) for both measures but must be interpreted with caution since they are based on the assumption that students rather than classrooms are the experimental unit.

* The regression weights of the individual predictor variables are reported in Appendix G.

TABLE V

Traditional Achievement Measures
Squared Multiple Correlations and Increments in
Squared Multiples by Clusters of Predictor Variables

Work Study Skills Posttest							
Cluster ^a	Number of Variables in Cluster	Grade 4 (N=181)		Grade 5 (N=186)		Grade 6 (N=184)	
		SMC ^b	Inc ^c	SMC	Inc	SMC	Inc
1	3	.460	.460	.636	.636	.699	.699
2	2	.486	.026	.645	.009	.701	.002
3	2	.486	.000	.648	.003	.703	.002
4	5	.545	.059	.664	.016	.726	.023
Social Studies Achievement Posttest							
Cluster ^a	Number of Variables in Cluster	Grade 4 (N=183)		Grade 5 (N=187)		Grade 6 (N=186)	
		SMC ^b	Inc ^c	SMC	Inc	SMC	Inc
1	3	.428	.428	.568	.568	.499	.499
2	2	.450	.022	.575	.007	.506	.007
3	2	.451	.001	.579	.004	.507	.001
4	5	.481	.030	.588	.009	.534	.027

^a See Table 37 for list of variables in each cluster.

^b Squared multiple correlation.

^c Increment in squared multiple.

The interaction of Level of Implementation with Verbal Ability and Level of Independence Pretest resulted in little increase in the squared multiple correlations.

There is a hint of a contribution to predictive power by the Cluster 4 variables at grades 4 and 6. At grade 4 the increment is significant at the .05 level for Work Study Skills using students as the unit of analysis. No other increments reached the .05 significance level.

Independent Study Measures

Two measures of student outcomes were directly related to the independent learning treatment. The Level of Independence Interview, Part II, measured the degree to which a student could work independently, particularly his or her skill in planning an independent project. The Product Evaluation measured the end result of students having engaged in an independent learning experience--in other words, evaluated products developed by the students.

Table VI lists the squared multiple correlations and increments for each predictor cluster.

TABLE VI

Level of Independence Posttest
Squared Multiple Correlations and Increments in Squared Multiples
by Clusters of Predictor Variables

Cluster ^a	Number of Variables in Cluster	Grade 4 (N=181)		Grade 5 (N=186)		Grade 6 (N=184)	
		SMC ^b	Inc. ^c	SMC	Inc.	SMC	Inc.
1	3	.135	.135	.117	.117	.294	.294
2	2	.146	.011	.131	.014	.309	.015
3	2	.179	.033	.136	.005	.312	.003
4	5	.197	.018	.158	.022	.372	.060

^a See Table IV for list of variables in each cluster.

^b Squared multiple correlation.

^c Increment in squared multiple correlation.

The predictive power of Cluster 1 is considerably less for the LOI than for the traditional achievement measures. When Cluster 2 is added, the increments in the squared multiple correlations are small at all three grade levels. The grade 4 increment for Cluster 3 is statistically significant if students are used as the experimental unit. Level of implementation combined with LOI pre or verbal ability has a significant, but small, predictive value for fourth grade students' end-of-year levels of independence. The addition of Cluster 4 provides no significant increments in the SMC at any grade level.

A regression of Level of Independence Posttest on Level of Independence Pretest for Grade 4 further suggests that students who had a relatively high level of independence at the time of the pretest benefitted from being in a class with a high level of independent learning. Students with a low level of independence did not.

The products resulting from student projects were an intuitively appealing source of information about students' accomplishments in independent learning. As was explained in Chapter Two, products were evaluated for a total of 94 target students from all three grades combined. Because of missing data on one or more predictor variables, data for only 80 of these 94 students were included in the regression analyses. The squared multiple correlations and increments in squared multiples obtained from the regression analyses are reported in Table VII for three product evaluation dimensions (originality and resources being combined).

An immediately striking result is the relatively low predictive power of Cluster 1 compared to what was previously observed for the traditional achievement measures and the level of independence measure. The magnitude

TABLE VII

Product Evaluation Dimensions
 Squared Multiple Correlations and Increments in
 Squared Multiples by Cluster of Predictor Variables
 (Grades 4, 5, and 6 Combined, N=80)

Cluster ^a	Number of Variables in Cluster	Dependent Variable					
		Global Quality		Cognitive Quality		Originality/ Resources	
		SMC ^b	Inc ^c	SMC	Inc	SMC	Inc
1	2	.039	.039	.099	.099	.004	.004
2	3	.150	.111	.147	.048	.033	.029
3	2	.208	.058	.228	.081	.045	.012
4	6	.290	.082	.302	.074	.055	.010

of the increment in the SMC associated with the quasi-level of implementation cluster also is larger than for the other measures. Fairly sizeable increments in the SMC also occur for Clusters 3 and 4, particularly for global and cognitive quality.

Regression analyses for global quality and cognitive quality and Level of Independence Pretest further suggest that students in high implementation classes perform better on global quality except for those students who are approximately two or more standard deviations above the mean on Level of Independence Pretest. These students appear to do well regardless of the classroom setting in which they are working. Students with a relatively low level of independence at the time of the pretest do best in a middle level of implementation setting and least well in a low level of implementation setting.

Five affective variables were studied: self-concept related to learning and school activities, attitude toward teacher, attitude toward school, attitude toward learning, and attitude toward social studies.

Table VIII reports the cluster analyses for these variables. Only three clusters are listed inasmuch as the interactions of level of implementation with Level of Independence Pretest and with Verbal Ability were eliminated from these analyses.

Affect outcomes exhibited basically decreasing trends in mean scores from grades 4 to 6 for Sears self-concept, attitude toward teacher, attitude toward school, and attitude toward social studies. In general, the student input cluster of predictor variables (Cluster 1) explained most of the variance in the dependent affective variables. However, for attitude toward teacher and attitude toward social studies, the amount of variance explained by Cluster 1 was somewhat less than might have been expected.

Little additional variance was explained by the cluster containing the quasi-treatment (level of implementation and target/nontarget) variables. In only four of the eighteen analyses did the quasi-treatment cluster explain a statistically significant amount of additional variance. Of the four, only two showed an increase greater than .03 in the squared multiple correlation. These were in grade 5 attitude toward social studies and self-concept scale.

Cluster 3, which consisted of the classroom climate variables for the two self-concept dependent variables and the classroom climate variables plus the self-concept scale posttest score for the other four affective variables, explained more of the variance in students' posttest scores on the affective measures than might have been expected. The predictability was lowest for the two self-concept measures, .01 to .08. For the other variables, the amount of variance explained ranged from .04 to .22, with nine out of twelve increases in the squared multiple correlations being above .10.

TABLE VIII

Affective Variables
Squared Multiple Correlations and Increments in
Squared Multiples by Clusters of Predictor Variables

Self-Concept Scale (Liddle) Posttest							
Cluster	Number of Variables in Cluster	Grade 4 (N=184)		Grade 5 (N=189)		Grade 6 (N=185)	
		SMC ^a	Inc. ^b	SMC	Inc.	SMC	Inc.
1	2	.369	.369	.387	.387	.453	.453
2	2	.393	.024	.470	.083	.461	.008
3	4	.471	.078	.484	.014	.501	.040
Self-Concept Inventory (Sears) Posttest							
Cluster	Number of Variables in Cluster	(N=186)		(N=188)		(N=186)	
		SMC	Inc.	SMC	Inc.	SMC	Inc.
1	2	.331	.331	.331	.331	.488	.438
2	2	.356	.025	.331	.000	.447	.009
3	4	.398	.042	.374	.043	.473	.026
Attitude Toward Teacher Posttest							
Cluster	Number of Variables in Cluster	(N=184)		(N=188)		(N=185)	
		SMC	Inc.	SMC	Inc.	SMC	Inc.
1	2	.138	.138	.280	.280	.064	.064
2	2	.380	.000	.301	.021	.091	.027
3	5	.241	.103	.349	.048	.176	.085
Attitude Toward Social Studies							
Cluster	Number of Variables in Cluster	(N=184)		(N=188)		(N=185)	
		SMC	Inc.	SMC	Inc.	SMC	Inc.
1	2	.064	.064	.207	.207	.260	.260
2	2	.066	.002	.259	.052	.274	.014
3	5	.286	.220	.371	.112	.433	.159
Attitude Toward Learning							
Cluster	Number of Variables in Cluster	(N=184)		(N=188)		(N=185)	
		SMC	Inc.	SMC	Inc.	SMC	Inc.
1	2	.216	.216	.258	.258	.283	.283
2	2	.222	.006	.271	.013	.288	.005
3	5	.417	.195	.371	.100	.366	.078
Attitude Toward School							
Cluster	Number of Variables in Cluster	(N=184)		(N=188)		(N=185)	
		SMC	Inc.	SMC	Inc.	SMC	Inc.
1	2	.333	.333	.449	.449	.275	.275
2	2	.336	.003	.462	.013	.277	.002
3	5	.439	.103	.573	.111	.390	.113

^a Squared Multiple correlation.

^b Increment in squared multiple correlation.

Conclusions

The results indicated that teachers can be trained to implement an innovative instructional system--in this case, an independent learning system. Further, some analyses suggest that students in middle level of implementation classes, where few (six target) students were engaged in independent learning activities had a higher quality of teacher attention and guidance than students in those classes where 50 percent, or more, of the students participated in independent learning. This, in turn, raises questions regarding the extent to which a teacher can, or should, carry out such a system with all students in a given classroom.

The results also suggest that the dynamics of such an independent learning system are complex. This is exemplified by the various interactions of student's level of independence and level of implementation of the system and student outcomes. The context of the instructional situation, including the abilities of the participants, numbers of students involved in what types of activities, the climate of the setting, etc.; student motivation; and competition for resources; are among the types of variables that need to be investigated in order to determine whether to utilize such an independent learning system.

Moreover, independent learning will not be equally effective for all students. In terms of conventional achievement outcomes, students who engage in independent learning activities can be expected to do no better or worse than students in other types of instructional systems. They can be expected to produce better products as a result of carrying out an independent project than students with little, or no, experience in independent learning.

TABLE OF CONTENTS

	Page
Acknowledgements	i
Abstract	iii
Table of Contents	xxvii
List of Tables	xxix
List of Figures	xxxiii
CHAPTER ONE: BACKGROUND	1
Purposes	1
Research Questions	4
Review of Literature	5
CHAPTER TWO: SAMPLE AND METHODOLOGY	13
Teacher Sample	13
Student Sample	24
Low SES Classrooms	26
Design for the Study	28
Statistical Procedures	39
CHAPTER THREE: DEPENDENT AND INDEPENDENT VARIABLES AND MEASURES	49
Student Variables and Instruments	49
Process Variables	89
CHAPTER FOUR: RESULTS	97
Teacher Performance	97
Classroom Organization	104
Student Outcomes	119

	Page
CHAPTER FIVE: DISCUSSION AND IMPLICATIONS FOR FUTURE RESEARCH	167
Significant Aspects of the Research Strategy	167
Summary of Results	172
Implications for Future Research	184
Bibliography	187
APPENDIX A: Content of Minicourse 15	
APPENDIX B: Student Attrition by Class for Treatment Socioeconomic Status and Grade	
APPENDIX C: Descriptive Statistics for Student Measures by Treatment, Socioeconomic Status, and Grade	
APPENDIX D: Factor Analysis of Student Attitude Questionnaire	
APPENDIX E: Results of Analysis of Variance and Discriminant Analyses of Classroom Observation Data	
APPENDIX F: Student Interview Responses by Level of Implementation and Grade	
APPENDIX G: Summary Tables for Multiple Regression Analyses by Grade Level for each Dependent Variable	

LIST OF TABLES

	Page
TABLE 1: DISC Total Mean Score and Standard Deviation Study and Special Control Teachers	18
TABLE 2: Distribution of Schools and Teachers by School SES, Treatment/Control Groups, and DISC Scores	20
TABLE 3: Schools by SES and Treatment/Control, Teachers by SES, Treatment/Control and Grade Level, Phase II	21
TABLE 4: Teacher Background Information	23
TABLE 5: Student Sample, Phase II	27
TABLE 6: Levels of Use of the Innovation: Typical Behaviors	35
TABLE 7: Number of Teachers by Level of Implementation, Grade, Treatment/Control Group	38
TABLE 8: Number of Target Students by Grade, Level of Implementation, and Treatment/Control Group	39
TABLE 9: Phase II Study Variables and Instruments	50
TABLE 10: Social Studies Achievement Test, Psychometric Data, Target and Nontarget Students	53
TABLE 11: Work Study Skills Test, Psychometric Data, Target and Nontarget Students	54
TABLE 12: Self-Concept Questionnaire, Psychometric Data Target and Nontarget Students	55
TABLE 13: Student Attitude Questionnaire, Psychometric Data Target and Nontarget Students	59
TABLE 14: Student Attitude Questionnaire, Subscale Intercorrelations	60
TABLE 15: Level of Independence, Psychometric Data	64
TABLE 16: Coding Reliability of Interviewers on Six Test Dialogues	66
TABLE 17: Coding Reliability of LOI Interviewers at Midtest and Posttest Training	67
TABLE 18: Connotative Meanings Associated with Each of the Four Product Evaluation Dimensions	71

	Page
TABLE 19: Number of Products Expected and Obtained for Treatment and Control Target Student Sample by Grades and SES Level	73
TABLE 20: Paradigm for Scalogram Analysis, Ideal Pattern of a Judge's Dichotomous Choices Reflecting Perfect Internal Consistency in the Ordinal Scaling of the Standards (e.g., Dimension 1, Judge 1)	81
TABLE 21: Modified Coefficient of Reproducibility by Judge and Dimension	83
TABLE 22: Paradigm for Estimating Interjudge Reliability (e.g., Dimension 1 - Global)	84
TABLE 23: Estimated Interjudge Reliabilities, Student Product Evaluation	85
TABLE 24: Student Product Evaluation, Intercorrelations between Ratings	86
TABLE 25: Short Test of Educational Ability (Verbal Ability) Psychometric Data	88
TABLE 26: Phase II Study, Process Variables and Instruments	89
TABLE 27: Coding Reliability on Student Interview, Five Model Interviews	91
TABLE 29: Percent Agreement Between Trainer and Observer on Four Observation Variables	93
TABLE 30: Social Climate Questionnaire Subscales, Psychometric Data, Target and Nontarget Students	96
TABLE 31: Use of Assessing Behaviors in Minicourse 15 by Teachers Receiving Training	99
TABLE 32: Use of Planning Behaviors in Minicourse 15 by Teachers Receiving Training	101
TABLE 33: Classroom Observation, Level of Significance Test of ArcSin Transformations of Proportions	108
TABLE 34: Mean Proportions of Teacher Activities in Various Categories by Observation Period for Non Use and High Use Implementation Groups	113
TABLE 35: Students Reporting a Discussion of Objectives with Their Teacher on a One-to-One Basis	116
TABLE 36: Distribution of Student Influence by Level of Implementation	117

	Page
TABLE 37: Clusters of Predictor Variables Student Outcome Analyses	121
TABLE 38: Work Study Skills, Pretest and Posttest Means and Standard Deviations by Grade and Level of Implementation	124
TABLE 39: Work Study Skills Posttest, Squared Multiple Correlations and Increments in Squared Multiples by Clusters of Predictor Variables	125
TABLE 40: Social Studies Achievement, Pretest and Posttest Means and Standard Deviations by Grade and Level of Implementation	129
TABLE 41: Social Studies Achievement Posttest, Squared Multiple Correlations and Increments in Squared Multiples by Clusters of Predictor Variables	130
TABLE 42: Level of Independence Posttest, Squared Multiple Correlations and Increments in Squared Multiples by Clusters of Predictor Variables	133
TABLE 43: Parallelism of the Regression of Level of Independence Posttest on Level of Independence Pretest by Level of Implementation	135
TABLE 44: Intercorrelations of the Product Evaluation Dimensions (Grades 4, 5, and 6 Combined, N=94)	140
TABLE 45: Product Evaluation Dimensions, Squared Multiple Correlations and Increments in Squared Multiples by Cluster of Predictor Variables (Grades 4, 5, and 6 Combined, N=80)	141
TABLE 46: Global Quality by Level of Implementation Means and Standard Deviations	143
TABLE 47: Self-Concept Scale, Pretest and Posttest Means and Standard Deviations by Grade and Level of Implementation (20-item Liddle Scale)	150
TABLE 48: Self-Concept Inventory, Pretest and Posttest Means and Standard Deviations by Grade and Level of Implementation (24-item Sears Inventory)	150
TABLE 49: Self-Concept Scale (Liddle) Posttest, Squared Multiple Correlations and Increments in Squared Multiples by Clusters of Predictor Variables	151
TABLE 50: Self-Concept Inventory (Sears) Posttest, Squared Multiple Correlations and Increments in Squared Multiples by Clusters of Predictor Variables	152

	Page
TABLE 51: Attitude Toward Teacher, Pretest and Posttest Means and Standard Deviations by Grade and Level of Implementation	154
TABLE 52: Attitude Toward Teacher Posttest, Squared Multiple Correlations and Increments in Squared Multiples by Clusters of Predictor Variables	155
TABLE 53: Attitude Toward Social Studies, Pretest and Posttest Means and Standard Deviations by Grade and Level of Implementation	158
TABLE 54: Attitude Toward Social Studies, Squared Multiple Correlations and Increments in Squared Multiples by Clusters of Predictor Variables	159
TABLE 55: Attitude Toward Learning, Pretest and Posttest Means and Standard Deviations by Grade and Level of Implementation	161
TABLE 56: Attitude Toward Learning, Squared Multiple Correlations and Increments in Squared Multiples by Clusters of Predictor Variables	162
TABLE 57: Attitude Toward School, Pretest and Posttest Means and Standard Deviations by Grade and Level of Implementation	163
TABLE 58: Attitude Toward School, Squared Multiple Correlations and Increments in Squared Multiples by Clusters of Predictor Variables	164

LIST OF FIGURES

	Page
FIGURE 1: Continuum of Approaches to the Study of Teaching	3
FIGURE 2: Distribution of DISC Scores for Study and Special Control Teachers	17
FIGURE 3: Classroom Observation, Proportion of Student Influences by Category	110
FIGURE 4: Classroom Observation, Proportion of Time that Various Numbers of Students are Engaged by Teacher	112
FIGURE 5: Within Group Regressions of Level of Independence Posttest on Level of Independence Pretest, Grade Four	136
Figure 6: Within Group Regressions, Global Quality on Level of Independence Pretest, High and Low Levels of Implementation	145
FIGURE 7: Within Group Regression, Cognitive Quality on Level of Independence Pretest Low, Middle, High Levels of Implementation	147

CHAPTER ONE

BACKGROUND

This chapter discusses the purposes of the Independent Learning Study within the broader framework of research on teaching at the Far West Laboratory, states the research questions to which the study was addressed, and summarizes a review of selected literature.

PURPOSES

The Independent Learning Study was conducted as part of the Effective Teacher Education Program (ETEP), a program of research and development in teaching at the Far West Laboratory for Educational Research and Development.

During the period from 1966 to 1975, ETEP had three major purposes: (1) to develop a series of Minicourses, teacher training materials which incorporate the microteaching approach to training and develop specific teaching skills; (2) to study the effects upon student outcomes of specific teaching skills; and (3) to test various approaches to the study of teaching. Along with several other programmatic efforts directed toward the latter two purposes, the Independent Learning Study grew out of the Laboratory's work in developing the Minicourses.

In 1966, the Laboratory's Teacher Education Program received federal funding to develop the series of teacher training materials called Minicourses (Borg, Kelley, Langer, and Gall, 1970). Research evidence accumulated in the development and testing of these Minicourses has shown they are effective in bringing about desirable changes in teachers' classroom behavior. But although a small number of studies prior to 1974 (Hofmeister and Stowitschek, 1974; Strickler, 1972; and Vard, 1971) also had examined the effects on

student learning of the changes in teacher behavior brought about by Minicourse training, up to that time we knew relatively little about whether or not students of Minicourse trained teachers learned more than students of teachers who had not received Minicourse training.

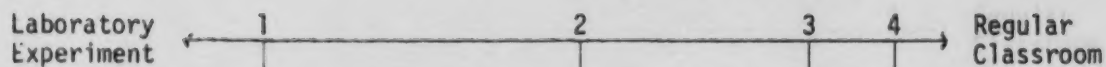
Since 1974, several studies have been conducted of the effects of teacher use of skills contained in various of the Minicourses (for example, see Williams, et al., 1976a, 1976b; and Gall, et al., 1976). These studies were part of an ambitious multi-year program of research on teaching effectiveness. They investigated:

- Use of an independent learning system. The purpose of this study, which is reported here, was to investigate the effect upon students of an independent learning system. Teacher training in the implementation and use of the system was provided through Minicourse 15: Organizing Independent Learning--Intermediate Level.
- Use of questioning skills. Two studies were conducted to investigate the effects on student achievement and attitudes of teacher use of questioning skills drawn from Minicourse 1: Effective Questioning--Elementary Level and Minicourse 9: Higher Cognitive Questioning.
- Use of mathematics tutoring skills. Three studies were conducted, each employing a different individual in the tutorial role (regular classroom teacher, paraprofessional, junior high school student). The tutoring skills studied were based on those presented in Minicourse 5: Individualizing Instruction in Mathematics.

In addition to studying the effects on students of teacher use of these sets of skills, these studies explored four approaches to the study of teaching. As illustrated in Figure 1, these approaches fall along a continuum of research techniques that range from a tightly controlled laboratory experiment to work in the regular classroom where instructional and other variables are allowed to vary naturally.

FIGURE 1

Continuum of Approaches to the Study of Teaching



- 1--Semi-programmed approach
- 2--Experimental Teaching Unit
- 3--Train teacher; study specific skills in specified instructional setting
- 4--Train teacher; establish instructional system; study overall effect.

The semi-programmed approach was used in the ETEP questioning studies. In this approach, the teacher is provided with a set of curricular materials which are to be used in a specified sequence and at stated times. In the questioning studies, teachers were given a script detailing the content and sequence of questions to ask in discussion. The approach was only "semi" programmed because some teacher behaviors during discussion were contingent upon student responses.

The second approach, the Experimental Teaching Unit (ETU), was incorporated as a sub-study of the mathematics tutoring study with teachers as tutors. An ETU consists of a statement of teaching and learning objectives, curricular materials for students, and criterion referenced pre and post tests. Teachers are allowed to organize and teach the unit as they wish. This approach, therefore, controls the content but not the process of instruction.

The third approach indicated in Figure 1 was used in the mathematics tutoring studies in which tutors were trained to use a specified set of skills and the effects were studied when the skills were applied in an on-going program of mathematics instruction. This is a familiar form of research

on teaching and has been used in a large number of the existing studies on teaching.

The fourth ETEP approach to the study of teaching parallels the research procedures applied in many previous studies of innovative educational programs. Teachers are trained in a new educational program, the program is put into operation, and the effects on students are studied. This was the approach employed in the Independent Learning Study.

RESEARCH QUESTIONS

The Independent Learning Study investigated the effects upon student outcomes of training teachers in the use of an innovative instructional system--namely, an independent learning system based on Minicourse 15: Organizing Independent Learning--Intermediate Level. During the first phase of the study, those teachers assigned to the treatment group received training in Minicourse 15; then, during the second phase, they implemented the independent learning system in their classrooms.

The research question during Phase I was:

What are the effects of Minicourse 15 training on teacher behaviors related to organizing independent learning?

The research questions investigated during Phase II, classroom implementation, were:

1. Does the organization of learning activities in classrooms of teachers who have implemented an independent learning system differ from the organization in classrooms where the system has not been implemented?
2. What are the effects of the independent learning system on student outcomes as measured by traditional achievement instruments in:
 - a. social studies achievement?
 - b. work study skills?

3. What are the effects of the independent learning system on student variables directly associated with independent study:
 - a. level of independence?
 - b. quality of a student product produced independently?
4. What are the effects of the independent learning system on student affective outcomes:
 - a. attitudes toward teacher, social studies, learning, school?
 - b. self-concept?

Independent learning in social studies in grades 4, 5, and 6 was the focus of the study.

REVIEW OF THE LITERATURE

Independent study has been variously defined in the literature. Beggs and Buffie (1965) defined it as a learning situation within a school day that allows a student to develop personal competencies as an individual. Klausmeier, Morrow, and Walter (1968) described independent study as a setting in which the student works on an individual assignment without continuous interaction with or supervision by the teacher. MacDonald (1970) suggested that in independent learning, "children are engaged in a curriculum task without benefit (or hindrance) of any immediately observable interpersonal mediation." In a comprehensive survey of the literature, Gibbons (1970) found that although definitions of independent study differ, two major elements are mentioned frequently: individual study (study by one's self) and self-directed study.

The independent learning system that was implemented in the research reported here was based on a concept of independent study which emphasized (1) individualization of instruction; and (2) student participation in decision making about learning. Support for both of these elements in instructional

procedures is found widely in the literature (e.g., Bloom, 1968; DeLi, 1972; Alschuler, 1968; Fisher, 1973).

This independent learning system also was characterized by the use of independent learning contracts which served as a monitoring tool for the teacher and a learning guide for the student. Minicourse 15 presents the specific teaching skills required to establish such contracts with students, based on seven essential elements of a contract that have been identified in the literature as supportive of independent student learning. These seven elements are:

1. Specification of what is to be learned (Sullivan, 1969; Ausubel, 1963).
2. Specification of how the student will demonstrate that he has learned the skills and knowledge (Bloom, 1968).
3. Identification of the resources the student will use in completing the contract (Ward, 1973).
4. Specification of the major learning steps or tasks (Ausubel, 1968; Maher and Sjogren, 1971).
5. Establishment of checkpoints for determining progress (Bloom, 1968; Skinner, 1968).
6. Establishment of deadlines (Carroll, 1963; Bloom, 1968).
7. Identification of an activity to be undertaken upon completion of the contract (Johnson and Martin, undated).

See Appendix A for additional discussion of Minicourse 15 content.

Effects on Students

Research into the effects on students of independent study has been limited and generally marked by methodological problems in studying student outcome variables in the affective domain (Kahn and Weiss, 1973; Gardner, 1967) and by inadequate specification of the teaching procedures used. A few studies have reported positive effects on students in terms of increased

behavior that is self-initiated (Scanlon, 1966; Nyquist and Hawes, 1972), and some studies of open education plans have reported that students in open schools had better attitudes toward school and toward themselves (Traub, et al., 1973).

Other research, however, has called into question the effects on students of various forms of "informal," "indirect," or "open" education. Rosenshine (1976) reviewed research since 1970 on instruction in reading and mathematics in the primary grades for low socioeconomic status students and concluded that "time spent by students working alone was usually negatively related to achievement." He reported that "a pattern of direct instruction, consisting of small steps at the student's level and a great deal of work mediated by either the teacher or workbooks, all of which is directed by the teacher, appear most functional." Stallings and Kascovitz (1974), studying Follow Through Planned Variation programs for low socioeconomic students in the primary grades, reported consistent, negative, and usually significant correlations with achievement for students working alone. And, in summarizing the results of Phase II of California's Beginning Teacher Evaluation Study which examined second and fifth grade teaching of reading and mathematics, McDonald (1976) concluded that if "classroom organizational structure or teacher performance provides for direct instruction by the teacher, learning will be improved."

In a similar vein, Bennett (1976) conducted a four-year study of open and traditional classrooms at the third and fourth grade levels in Great Britain. Generally he found that pupils taught formally (with structured lesson plans, fixed work schedules, a reward system) achieved significantly greater gains on standardized tests of reading, writing, and arithmetic than

pupils in informal classes (with self-scheduled work, integration of subjects, no effort to curb talking or movement, no tests or grading). Furthermore, he reports that while pupils in informal classes spent more time cooperating with each other, they did not show superior skills in story-writing. Bennett states as a central conclusion "that a degree of teacher direction is necessary, and that this direction needs to be carefully planned, and the learning experiences provided need to be clearly sequenced and structured."

Certain differences between the preceding studies and the Independent Learning Study which is reported here should be kept in mind.

First, the Independent Learning Study was concerned with students in the fourth through sixth grades, whereas the preponderance of subjects in the research just cited were younger. Several researchers (e.g., Brophy, 1975) have suggested that the effects of teacher behavior in indirect teaching processes vary with the grade level of the students.

Second, the Independent Learning Study investigated pupil outcomes in the social studies, whereas the foregoing studies were concerned with reading, mathematics and/or language arts. McDonald (1976) has concluded from the Beginning Teacher Evaluation Study that the effectiveness of teaching behaviors differs by subject matter as well as by student grade level.

Third, the Independent Learning System which was implemented in this study differs in what would appear to be critical respects from the instructional patterns described as "open" and "informal." The learning contracts in this study between students and teachers (see earlier in this chapter) provided a structure and sequence for learning, a schedule for monitoring pupil progress, and a reward system--elements of the instructional environment generally excluded from the definitions of informal or open learning by researchers such as Bennett.

Variables

Because of the failure of many studies to define variables operationally and the dearth of research based on experimental designs, the literature specifically concerned with independent learning provided little direct assistance in the selection of variables for the Independent Learning Study. However, the literature did provide certain important suggestions.

A number of writers have offered the critique that research in independent learning has tended to overemphasize process evaluation at the expense of looking at the end product of student outcomes (Niedermeyer and Klein, 1972; McNeil and Popham, 1973; Rosenshine and Furst, 1973). Moreover, some researchers have suggested that previous studies have erred in using only such conventional product variables as performance on standardized achievement tests. This criticism has been extended recently by Bennett (1976), who used measures specifically chosen to be sensitive to the range of teaching behaviors investigated, and Soar (1972), who has postulated a direct relationship between the complexity or abstractness of the pupil gain measure and the indirectness of teacher behavior associated with greatest pupil growth.

Thus, the Independent Learning Study included as student outcome variables both performance on a social studies achievement test and performance on independent learning tasks--a product variable specifically related to the treatment. (See Chapter Four for details of variables and instruments.) Other student outcome variables also were selected to be sensitive to the treatment (level of independence, use of reference materials) as well as to reflect claims in the literature about the effects on students of independent learning in terms of self-concept (Heimgartner, 1972; Bussis and Chittenden, 1970; Tuchman, Cochran, and Travers, 1973) and attitudes (Traub, et al., 1973; Nelson, 1973; Rogers, 1969; MacDonald, 1970; Barth, 1972).

Another well-documented problem in much research about teaching has been associated with specification of classroom teaching-learning behavior. Rosenshine and Furst (1973), Bennett (1976), and Soar (1967), for example, have complained about the failure to attend to a sufficient sample of classroom events and to describe them in more appropriate units than frequency counts. Their objections are underscored by recent research that relates student outcomes to the specificity of the instructional task, curriculum structure, and amount of time in which students are engaged in learning (McDonald, 1976; Bennett, 1976; Rosenshine, 1976). For the Independent Learning Study, three process variables related to classroom events were investigated: the amount of independent study, classroom organization and learning activities, and social climate (i.e., diversity of activities, clarity of instructional objectives, simplicity of performing instructional tasks, and pacing).

Summary

While educators have espoused independent study for many years in the belief that it improves student attitudes, encourages originality, and develops such characteristics as initiative and self-direction in learning, the literature contains few reports of careful research on actual student outcomes. Many studies have been marked by methodological problems in studying outcomes in the affective domain; many have not attended to variables of product as well as process; most have failed to specify adequately the teaching behaviors actually employed and the nature of classroom events. Although a few recent studies of informal or open education have employed more exacting research procedures, they have investigated outcomes for students somewhat younger than those in the Independent Learning Study, in different subject

areas, and under different instructional processes. The Independent Learning Study, therefore, provides an opportunity to give special consideration to some of the problems in previous research in an effort to obtain more interpretable data about student outcomes in a specified process of independent learning.

CHAPTER TWO

SAMPLE AND METHODOLOGY

The overall purpose of the Independent Learning Study was to investigate the effects upon student outcomes of training teachers in the use of an innovative instructional system. The Independent Learning System, based on Minicourse 15: Organizing Independent Learning--Intermediate Level, was the instructional system studied.

The study was conducted in two phases. Teachers assigned to the treatment group received Minicourse training during Phase I of the study and then implemented independent learning systems in their classrooms during Phase II. Phase II investigated the effects of independent learning on student outcomes. Phase I, in addition to training the treatment teachers, was designed to investigate the teachers' acquisition of Minicourse 15 skills.

The research questions that were addressed in each phase were presented in the previous chapter. A discussion follows of the teacher and student samples, the design for the study, and the statistical procedures used in the study.

TEACHER SAMPLE

The study was conducted in the Los Angeles City (California) Unified School District with fourth, fifth, and sixth grade teachers--the grade levels for which Minicourse 15 was designed. The teachers were recruited and assigned to treatment and control groups as discussed below.

Because the study would be conducted over two school years (1973-74 and 1974-75), it was important that both the teachers and administrators of their schools be interested in independent learning and make a two-year

commitment to the study. The Associate Superintendent of the district therefore was asked to recommend schools in various areas of the district which he felt had some commitment to independent learning. The schools he listed as potential sites became the target schools from which teachers were recruited.

Meetings were then held with the principals of the target schools. During these meetings, project staff explained the nature of Minicourse 15 training and of the research and determined which principals were interested in the study. In each school where the principal expressed interest, the fourth, fifth, and sixth grade teachers were invited to a meeting at which the opportunities for training and the requirements of the research were explained. The teachers were then free to decide if they wanted to participate.

Eighty-six teachers from eighteen schools in six areas of the district volunteered with the understanding that they would be randomly assigned to one of two groups. The first group of teachers would be trained in the spring of 1974 and would implement an independent learning system in their classrooms during the 1974-75 school year. The second group would wait until the fall of 1975 to receive training and would act as a control group during the 1974-75 school year.

Student Influence in Classrooms

It was recognized that these recruitment procedures, while helping to insure selection of teachers with a commitment to the study, also could result in obtaining a sample which differed from the general population of teachers. For example, the teachers who volunteered for the study might have had more experience or interest in independent learning and therefore

might allow students more influence in classroom decisions than would teachers in the general population. If this were true, the generalizability of study results would be restricted.

To investigate this factor, consideration was given to forming a second control group based upon a random sample of teachers from the general population. However, practically speaking, such a random sample could not be obtained since it would be comprised of teachers who also would be volunteers. Rather than form a second control group, therefore, it was determined that comparability of the study teachers and teachers in general would be obtained by describing the amount of student influence in classrooms of the study teachers and of teachers in the general population. In this way, the degree to which student results could be generalized to the total population of teachers would be determined.

For this purpose, the Dimensions of Schooling Questionnaire (DISC) was administered in the winter of 1974 to the 86 volunteer study teachers, before their assignment to treatment groups, and to a sample of 40 other teachers from the Los Angeles City Unified School District. These 40 special control teachers were selected on the basis of grade level and school. All taught grades 4-6 in schools not included in the study sample--one school from each of the six areas of the Los Angeles Unified School District containing a study school. In these six schools, all grade 4-6 teachers served as special control teachers.

The Dimensions of Schooling Questionnaire was designed to assess the openness of an instructional program or the amount of student influence in the program (Traub, Weiss, Fisher, and Musella, 1973). The original DISC contained 28 items. For purposes of this study, it was revised by

deleting items which were deemed not relevant. The revised version contained 26 items describing dimensions of classroom organization and instruction (e.g., student pacing, selection of materials). Each dimension was broken down into three to five categories describing classroom activities related to the dimension. Categories were weighted by the developers of DISC according to the amount of program openness and student influence reflected in the category's activities. Teachers were asked to rate each category of a dimension by estimating the percentage of school time spent in the activities described. Dimension scores were obtained by calculating the weighted average of the category ratings. Total DISC scores, representing the sum of the dimension scores, could range from 0 to 26, with higher scores indicating greater student influence.

Figure 2 shows the distribution of total DISC scores for the study and special control teachers. The range of scores for the two groups was similar--a range of 14.5 for study teachers and 12.6 for special control teachers. With the exception of the two highest scoring teachers, all of the study teachers fell within the range of the special control group. Thus, the study group appears to have been comprised of teachers with a range of program openness similar to that found in a second, more general, sample of upper elementary teachers.

As can be seen from the total mean DISC scores reported in Table 1, the study teachers reported greater program openness and student influence overall than the special control teachers. Although not large, the difference was statistically significant ($t=2.44$, $df=124$, $p<.05$). The importance of this statistical difference is difficult to determine from a practical viewpoint. The actual difference in mean scores (less than

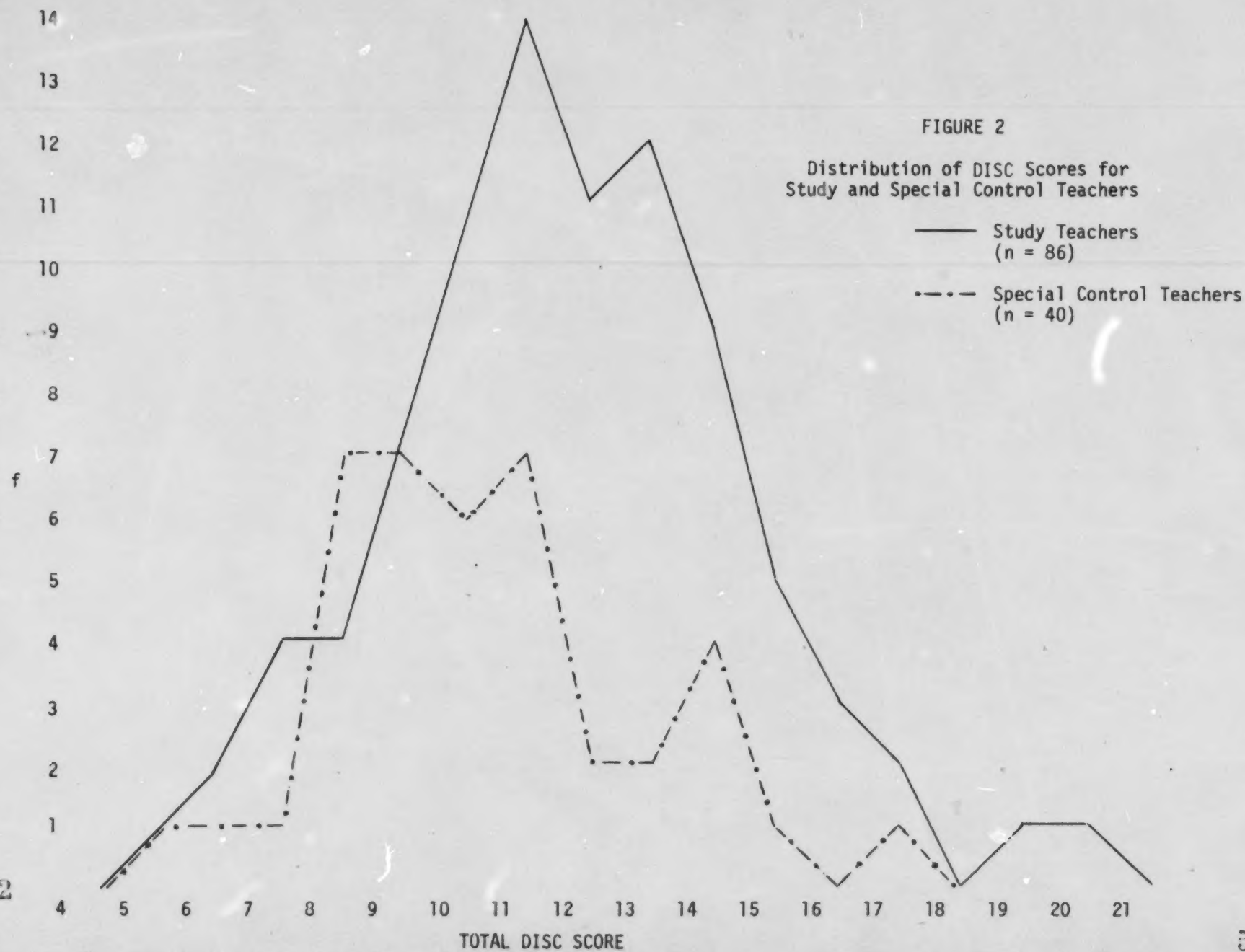


TABLE 1
DISC Total Mean Score and Standard Deviation
Study and Special Control Teachers

Teachers	n	Mean	Standard Deviation
Study	86	12.16	2.86
Special Control	40	10.85	2.60

1.5 points) was small, given a total possible score of 26. Further, the study sample contained teachers with a wide range of program openness, the preponderance of whom fell within the same range as the special control teachers. It appears, therefore, that although the study teachers on the average reported slightly greater openness and student influence on instruction than the special control teachers, the study sample contained teachers who were generally representative of a sample of non-volunteer teachers from schools within the same geographic areas of the school district.

Assignment of Teachers to Treatment and Control Groups

For Phase I of the study, teachers were assigned to treatment and control groups based upon the school in which they taught so that in any one of the eighteen schools, all participating teachers were assigned to the same group. This procedure was followed both to avoid the potential contamination effects of mixing control and treatment teachers in one school and to accommodate the practical constraints of Minicourse 15 training which made it inefficient to train fewer than four teachers in a school at one time.

Schools were randomly assigned to the treatment and control groups after stratification by socioeconomic status (SES) and by program openness as measured by the DISC. Stratification by SES was based on the median income of the census division containing the school, as reported in the 1970 Census Tracts. Median incomes ranged from \$3,956 to \$20,687 with two natural breaks in the income rankings, one at \$5,717 and one at \$11,021. Thus, low SES was defined as a median income less than \$5,717, medium SES as \$6,593 to \$11,021, and high SES as greater than \$12,668. Of the eighteen schools in the sample, two were low SES, six medium SES, and ten high SES. Stratification of schools by program openness was based on school DISC scores which were computed by averaging the scores of the teachers in each school on the Dimensions of Schooling Questionnaire. (See discussion in previous section of this chapter.)

Within each of the three SES groups, approximately half the schools above the median on DISC and half the schools below the median were randomly assigned to the treatment group. In order to allow for attrition, more schools were assigned to the treatment than control group. This was done because once teacher training was completed, it would be difficult to add to the treatment group. Ten schools, with a total of forty-six teachers, were assigned to the treatment group and eight schools, with a total of forty teachers, to the control group. Table 2 shows the distribution of schools and teachers by socioeconomic status, program openness (DISC scores), and treatment for Phase I.

During the 1974-75 school year, three of the eighteen schools were excluded from the main analysis. One school was dropped in Fall, 1974, because the teachers were using the Man, A Course of Study program and

TABLE 2

Distribution of Schools and Teachers
by School SES, Treatment/Control Groups, and DISC Scores
Phase I

SES	Treatment				Control			
	High DISC		Low DISC		High DISC		Low DISC	
	Schools	Teachers	Schools	Teachers	Schools	Teachers	Schools	Teachers
Low	1	5	0	0	0	0	1	4
Mid	1	5	2	10	1	5	2	10
High	<u>4</u>	<u>16</u>	<u>2</u>	<u>10</u>	<u>2</u>	<u>10</u>	<u>2</u>	<u>11</u>
Total	6	26	4	20	3	15	5	25

decided they did not have time to participate in the Independent Learning Study. In a second school with only three participating teachers, illness and loss of interest in the program resulted in the school's being dropped. The third school was eliminated because of inability to collect systematic and comprehensive posttest data. Thus, fifteen schools were included in Phase II: eight treatment schools and seven control schools. Resulting frequencies of schools by SES and treatment/control group and of teachers by SES, treatment/control, and grade are reported in Table 3. These frequencies represent the school and teachers-within-school sample used for reporting the outcomes of Phase II of the study.

For this phase, both the treatment and control schools were similarly distributed relative to the SES level of the population served. The treatment and the control samples each included one low SES school. Three mid-SES schools were in the treatment sample; two were in the control sample. Each sample included four high SES schools.

TABLE 3

Schools by SES and Treatment/Control
Teachers by SES, Treatment/Control and Grade Level
Phase II

	TREATMENT					CONTROL					GRAND TOTAL
	No. of Schools	Grade				No. of Schools	Grade				
		4th	5th	6th	Combined		4th	5th	6th	Combined	
Low SES	1	0 ^a	0	0	4	1	0	0	0	2	
Mid SES	3	4	1	3	2	2	5	5	1	0	
High SES	4	4	4	5	0	4	5	6	7	0	
Total Schools	8					7					15 ^b
Total Teachers by Grade		8	5	8	6		10	11	8	2	58
Total Teachers by Treatment/ Control		27 ^c					31 ^d				58

a. Number of teachers

b. Of the original 18 volunteer schools, three were dropped during the study year. One was a control school, reducing the number of control teachers by six; two were treatment schools, reducing the number of treatment teachers by 6.

c. Of the 45 teachers trained in Minicourse 15, 10 moved to administrative jobs or to schools not in the study before the 1974-75 school year. Two teachers had educationally handicapped classes during the study year and were dropped from the study. Six teachers dropped when their schools left the study.

d. Of the 40 control teachers, three moved to other schools before the study year. Six teachers dropped when their school left the study.

The teacher (classroom) sample for Phase II consisted of 27 treatment teachers and 31 control teachers. The loss in numbers of teachers as compared with Phase I was the result of dropping schools from the study sample which was noted above, and reassignment of teachers by the school district for the 1974-75 school year. The remaining sample of 58 teachers was considered adequate for the investigation of the Phase II research questions. The Phase II sample is reported by grade level, as well as treatment and school, because the data analyses that were conducted for this phase include separate analyses for each grade level.

Background of Teachers in Sample

In January, 1975, all teachers who remained in the study completed a questionnaire about their background and experience. Information was obtained about seven variables: age, sex, highest academic degree obtained, total number of years teaching, number of years teaching grades 4-6, length of time in present school, and total number of schools in which each had taught. The results are reported in Table 4.

No significant differences were found between treatment and control teachers on the background variables. The study sample was comprised primarily of females (75% for treatment, 82% for control, 79% for total group) across a wide range of ages. Although almost one-third of the treatment group teachers had received a Master's degree, the Bachelor's degree was the highest degree obtained by most study teachers (68% for treatment, 85% for control, 77% for total).

The teachers reported a large amount of teaching experience, with 52% of the entire sample having taught at least nine years. Only 21% of the

TABLE 4
Teacher Background Information

Variable	Treatment % of Group	Control % of Group	Signi- ficance Level*	Variable	Treatment % of Group	Control % of Group	Signi- ficance Level
Age:				No. Years Teaching Grades 4-6:			
24 or less	4	3		1 or less	4	9	
25-34	29	46		2	18	21	
35-44	36	30	.59	3	14	15	.88
45-54	29	21		4	21	15	
55 or more	4	0		5 or more	43	39	
Sex:				No. Years in Present School:			
female	75	82	.74	1 or less	4	6	
male	25	18		2	29	9	
Degree:				3	11	30	.20
Bachelors	68	85		4	18	18	
Masters	32	12	.12	5 or more	39	36	
Other	0	3		No. Schools Taught in:			
No. Years Teaching:				1	21	21	
2 or less	7	9		2	14	30	
3-4	14	12		3	29	21	.29
5-6	11	9	.86	4	7	15	
7-8	21	12		5 or more	29	12	
9 or more	46	58					

* Significance level based on Chi-square test of differences between frequency of Treatment and Control responses.

total sample had taught less than 5 years. In addition, well over one-third of the sample had taught in grades 4-6 for five or more years. Although the teachers varied in the number of schools in which they had taught, 38% had been in their present school at least five years.

STUDENT SAMPLE

Within each of the 58 classrooms in Phase II, two groups of students were selected on a stratified random basis as study participants.

The first group were the target students. Six students in each classroom were selected for this category. In the treatment classes, these students were identified to the teacher and were expected to carry out independent learning contracts in social studies during the school year. In the control classes, the target students were not directly identified to the teachers. However, they did receive special interviewing and testing during the school year and therefore could be identified as study participants.

The second student group were the nontarget students. Six students in each class were selected for this category in the same manner as the target students. The nontarget students were not identified to either treatment or control teachers and received no special interviewing and testing. They were selected to act as a within class control group.

Two variables, entry level of independence and sex, were considered in selecting target and nontarget students rather than using random selection. This decision was based on the assumption that a student's performance in an instructional system using independent learning might be related to sex-role attributes and readiness to work independently. The Level of Independence Interview conducted in the fall of 1974 provided a

measure of the student's entry level of independence as well as grade and sex. The Level of Independence (LOI) score had a possible range from 0-12. A score less than 4 indicated questionable data and was found most often in cases where students could not speak or understand English. For this reason, only students receiving a score of 4 or higher were included in the sample. For purposes of sample selection, the Level of Independence scores were categorized into Low (4,5,6), Mid (7,8,9) and High (10,11,12). Within each classroom, one male and one female student were randomly selected from each LOI category and assigned to the target group. Similarly, one male and one female at each LOI level were randomly selected and assigned to the non-target group. In cases where there were no students of the appropriate sex in a given LOI category, a student was randomly selected from students with the nearest level of independence score and labeled as a substitute. Whenever possible, substitutes were assigned to the nontarget group rather than the target group.

In classes composed of more than one grade level, the grade level of the majority of students was considered to be the class grade level. Selection of study participants was made first from the group of students in the majority grade level. If it was necessary to select students from the second grade level, the student was identified as a substitute and, whenever possible, assigned to the nontarget group.

During the year it was necessary to make replacements in the sample as students moved or, in a few instances, were identified as educationally handicapped. Selection of replacements followed the same procedure as selection of the original sample. No replacements were made after December, 1974.

Some attrition occurred in the student sample because of a student moving after December, 1974, or a student having incomplete posttest data (three or more measures missing).

Table 5 presents the original student sample (December, 1974) attrition, and final student sample (June, 1975) by treatment/control group, SES level of the school attended, and grade level. Attrition ranged from 3.8% in grade 6 control classrooms to 13.7% in the grade 6 treatment classes. The attrition data for each classroom are presented in Appendix B.

The final sample for Phase II of the study contained 93 grade 4 treatment students, 103 grade 4 control students, 75 grade 5 treatment students, 137 grade 5 control students, 120 grade 6 treatment students, and 101 grade 6 control students.

LOW SES CLASSROOMS

Only one low SES school was included under each treatment condition, and all low SES classes were combination grades. In addition, the low SES control school had sufficient attrition that only 19 subjects, across all grade levels, provided complete data by the end of the school year. Therefore, when the decision was made to analyze data separately within each grade level (later section in this chapter), the numbers of low SES students became too few to assume either population representativeness or treatment/control design balance on the SES dimension. As a result, low SES data were excluded from subsequent analyses, and generalizations and interpretive comments in this report will be restricted to middle and high SES schools. Elements of the low SES data and problems specific to

TABLE 5
Student Sample
Phase II

T R E A T M E N T	SES	4th Grade			5th Grade			6th Grade					
		Original Number ^a	Attrition ^b		Final Number ^c	Original Number	Attrition		Final Number	Original Number	Attrition		Final Number
			No: Moved	No. Dropped			No. Moved	No. Dropped			No. Moved	No. Dropped	
Low	7	1	1	5	11	2	0	9	30	4	2	24	
Mid	43	4	1	43	23	0	3	20	49	3	4	42	
High	48	3	0	45	48	2	0	46	60	3	3	54	
Sub Total	103	8	2	93	82	4	3	75	139	10	9	120	
C O N T R O L	Low	3	0	2	1	12	2	0	10	9	0	1	8
	Mid	49	1	2	46	59	1	1	57	13	0	1	12
	High	60	1	2	57	72	1	1	70	83	0	2	81
	Sub Total	112	2	6	104	143	4	2	137	105	0	4	101
	Total	215	10	8	197	225	8	5	212	244	10	13	221

- a. Number of students in sample December, 1974.
b. Number of students who moved after December, 1974 or had incomplete posttest data.
c. Number of students in sample June, 1975.

their collection as well as results are treated by case study/descriptive methods in a separate report.*

DESIGN FOR THE STUDY

As noted earlier, this study of the effects of an independent learning system on student achievement and attitudes incorporated two research phases. In Phase I, teachers assigned to the treatment group received training in the use of independent learning as presented in Minicourse 15: Organizing Independent Learning--Intermediate Level. The Phase II research studied the extent to which an independent learning system was implemented and the effects thereof. A discussion follows of the procedures and methods used in each phase.

Phase I: Teacher Training

The teachers assigned to the treatment group (originally 46) were given training in Minicourse 15 between February 6 and March 21, 1974. Training was conducted in the spring of 1974, rather than during the 1974-75 school year when the treatment teachers would implement the independent learning system, for two reasons.

First, a period of one school year was considered the minimum time required to install such a complex, new instructional strategy and observe its effects. If the training had been conducted in the fall of 1974, this condition would have been violated. Second, experience in the development and field testing of Minicourse 15 had demonstrated that teachers require two to three months after training before the contracting procedures operate

* Calcagno, S.C., and Trincherio, R.L. Independent Learning and Low Socio-Economic Classrooms: Problem of Program Implementation and Assessment. San Francisco: Far West Laboratory for Educational Research and Development, 1977.

smoothly. Training during the spring of 1974 thus allowed time for practice before beginning year-long operation of the instructional system. As a further measure to strengthen the treatment, teachers received retraining in September, 1974. A detailed report on the training phase can be found in Lai and Mills (1974).

In brief, it centered around Minicourse 15 which is a self-contained teacher training package designed to help teachers increase the independent learning opportunities of students. The Minicourse format was adapted from the Stanford University microteaching model in which teachers are videotaped during a lesson so that they can later view their performance and evaluate their use of certain skills.

During Phase I of this study, Minicourse 15 provided approximately fifteen hours of training over a five-week period. Each week, each teacher completed one instructional lesson comprised of six activities:

1. Viewing the lesson's instructional film
2. Studying the chapter of the Teachers Handbook related to the lesson
3. Planning, conducting, and videotaping a microteaching session in which the teacher practices the lesson's skills with a small group of students or a single student
4. Viewing the microteach videotape and self-evaluating use of the skills presented in the lesson
5. Conducting and videotaping a reteach session, usually with different students from those in the microteaching session
6. Viewing the reteach videotape and evaluating use of the skills presented in the lesson.

The teachers completed this sequence of activities on an individual basis. A coordinator from Far West Laboratory planned and scheduled such activities as viewing instructional films, arranging time and space for

microteaching, maintaining the videotape equipment, and providing general assistance to the teachers. Appendix A provides detailed information about the teaching skills covered in the training. Chapter Four includes a summary of the results of training and a description of the retraining that was conducted.

Phase II: Implementation

The classroom implementation phase of the study investigated the effects upon student outcomes of implementing an independent learning system in the classroom. This research was conducted during the 1974-75 school year. Independent learning in social studies in grades 4, 5, and 6 was the focus of the study.

Originally, Phase II was designed as a treatment/control study and data were collected under such a plan. However, as is explained later in this section, actual observations suggested that teachers' use of independent learning was not restricted to the treatment classrooms. Thus, each classroom was categorized according to presence of treatment. Data analyses were carried out based on the extent to which independent learning was used rather than the treatment/control designation. Each of these aspects of the Phase II study is outlined below.

Design for Data Collection

As noted above, a treatment/control group pre/post testing design was used in the data collection portion of the Phase II study. Classrooms of teachers receiving Phase I Minicourse 15 training comprised the treatment group. Classrooms of the remaining volunteer teachers, who had not received Minicourse 15 training, formed the control group.

All classrooms participated in the study throughout the entire 1974-75 school year. The initial independent learning contracts were developed in the treatment classrooms during early October, and the final independent learning contracts were completed in May.

As discussed in the student sample section of this report, within each of the treatment classrooms, two groups of students were randomly selected to serve as study participants. They were:

Target students. Six students in each class were selected and identified to the teacher as prime targets for the treatment. Treatment teachers were asked to carry out independent learning contracts in social studies with these six students regardless of the type of instructional system used with the other students.

Nontarget students. Six students were matched with the target students on the basis of sex and entry level of independence. These students were not identified to the teacher. Their involvement in independent learning contracts was dependent upon the extent to which the teacher implemented the system with the entire class. These students, therefore, served as a special within classroom control group.

Two groups of students also were selected as study participants in the control classrooms. These were:

Target students. Six students were selected in each control classroom to match as nearly as possible the same range of entry levels of independence and the same proportion of male/female students as represented by the treatment target students. Although the control target students were not specifically identified to the teachers, they received special testing and interviewing during the year and, therefore, could be identified as study participants.

Nontarget students. Six students were selected in each control class to serve as a within class control group. These students were matched with the six target students in each control classroom on the basis of sex and level of independence. The nontarget students received no special training and/or interviewing and, therefore, were not readily identifiable as study participants by their teacher or classmates.

Pretesting of students was carried out during a four-week period beginning September 20, 1974. All posttests, as well as final independent learning projects, were completed in a six-week period beginning April 21, 1975. Although only data for target and nontarget students were processed for analysis, group tests were administered to all students. The student measures used in the study are described in Chapter Three.

In addition to pre and posttesting, classroom observations were conducted throughout the school year to determine the extent to which the prescribed independent learning system was being used in both the treatment and control classrooms. A description of the observation forms and other process measures used to monitor implementation of the system also is provided in Chapter Three.

Treatment

Based upon the teaching skills included in Minicourse 15, the independent learning system that comprised the treatment for Phase II established a particular type of classroom organization, characterized by individualization of instruction and student self-direction. Learning contracts served as the vehicle for organizing the system. The contracts specified: (1) what was to be learned, (2) the way in which students would demonstrate their achievement, (3) the resources to be used by the students in carrying out the contracts, (4) the steps or tasks to be carried out, (5) the intermediate points at which progress would be judged, (6) the time schedule to be met, and (7) next steps to take when the contract was completed.

Typically, under this system, students were given assignments that required several days or possibly weeks to complete. Students had an opportunity to work in areas of their own interest and on projects which were self-directed in terms of activities, resources, and pace.

Independence in the system was dependent upon the students' maturity and the appropriateness of the contract assigned. If the objectives and learning tasks in a contract were within their capabilities, even the immature students were successful. The extent to which the teacher supervised a student's work depended upon his/her level of independence, particularly in terms of ability to identify and select a study topic and to stay on a learning task.

Treatment classrooms varied in the extent to which teachers employed the independent learning system--ranging from use of contracts with few students, with the six target students, to use of the system with all students in the class.

Design for Data Analysis

In preparing for Phase II data analysis, descriptive statistics were obtained on all student outcome variables. Tables C1-17 in Appendix C present the pre and posttest means and standard deviations for the treatment and control groups at each grade level for each variable. In reviewing these descriptive data, it was apparent that there were few differences between treatment and control group performance. It was decided, therefore, that additional analyses by treatment group would result in very weak treatment/control main effects and would provide little more information than that provided by the descriptive tables themselves.

In reviewing this situation, the research staff suggested that one possible reason for the small differences between treatment and control groups might be that some treatment (trained) teachers may not have fully implemented the independent learning system while some control teachers

may have been using an independent learning system in their classrooms. The existence of independent learning systems in control classrooms was especially possible inasmuch as all teachers in the study were recruited because of their interest in independent learning and because they taught in schools in which the administration supported independent learning. Likewise, although all treatment teachers were trained in the use of independent learning through Minicourse 15, it would not be unusual for the treatment teachers to vary in the degree to which they implemented the system in their classroom.

Hall, Loucks, Rutherford and Newlove (1975) suggest the effects of an innovation, such as the independent learning system, are dependent upon the degree to which the innovation is adopted. Adoption of an innovation is seen as a process or series of stages through which each user moves individually. As such, it is possible for users to vary in the degree to which they adopt the innovation. In studying the adoption process, Hall et al. have developed a framework by which to assess levels of use of an innovation. Eight levels of use (LoU) are defined. Each LoU describes observable user behavior exhibited at one of the eight stages of adoption. Table 6 provides a short description of the eight levels of use.

It therefore was determined that more information would be gained from the Phase II research effort if all classes in the study were regrouped into three categories based on the degree to which each teacher implemented an independent learning system of the type presented in Minicourse 15. A description follows of the procedures used in assigning level of implementation of an independent learning system to each Phase II classroom.

TABLE 6
Levels of Use of the Innovation:
Typical Behaviors

Level of Use	Behavioral Indices of Level
0 Non Use	No action is being taken to learn about new ideas in the area of the innovation.
I Orientation	The user is seeking out information about the innovation.
II Preparation	The user is preparing to use the innovation.
III Mechanical Use	The user is using the innovation in an awkward, poorly coordinated manner.
IVA Routine	The user is making minimal changes in use.
IVB Refinement	The user is making changes to increase impact.
V Integration	The user is coordinating with others in using the innovation.
VI Renewal	The user is seeking more effective alternatives to the established use of the innovation.

Adapted from: Hall, G.E., Wallace, R.C., and Dossett, W.F. "A Developmental Conceptualization of the Adoption Process Within Educational Institutions." Austin, Texas: Research and Development Center for Teacher Education, 1973.

Procedures for assigning level of implementation. The eight levels of use (LoU) defined by Hall et al. provided the framework for assigning level of implementation of the independent learning system to each classroom. Before LoU could be determined, it was necessary to identify teacher/student behaviors which would occur in a classroom in which the system as proposed in Minicourse 15 was fully implemented. The three behavioral criteria identified as important to routine use of the system (Level IV A in Table 6) were:

1. The teacher negotiates independent learning projects with students on a one-to-one basis.
2. A final project or other means of showing learning through independent study was agreed upon and known by both the teacher and student.
3. The number of students involved in the system:

Mechanical use--only the six target students were contracting for independent study in social studies on a regular basis.

Routine use --at least one half of the class was contracting for independent study in social studies on a regular basis.

Information on these three criteria was available for both treatment and control teachers through observations made during the study year and through teacher interviews and questionnaires. Dr. Gene Hall met with the project staff in October 1975 to review the collected information and to assign level of use to each teacher in the study. Dr. Hall did not know which teachers were trained, but assigned LoUs to all teachers on the basis of descriptions of their social studies curricula, the activities in their classroom, and the teachers' concerns and questions about independent study. The first six LoUs in Dr. Hall's system were found to exist in one or more of the study classrooms.

Levels 0, I, and II in Table 6 represent degrees of non-use. For purposes of the present study, these levels range from the teacher having no knowledge about the innovation through seeking information about independent study to preparing to implement the independent study in the classroom. Treatment and control teachers who were assigned LoU 0, I, and II were combined into a group representing non-users which was designated as Level of Implementation 1.

LoU III represents mechanical use of the innovation. Teachers assigned this rating were those who implemented the system only with the target students. This level represents minimum use of the system and was in operation in some treatment classes. For data analysis, these classes were assigned to Level of Implementation 2.

Levels of Use IVA and IVB represent users who have mastered the mechanics of the innovation and are using it regularly. In the present study, teachers had to be using independent learning contracts with at least 50% of their students in order to receive this rating. Teachers at these two LoUs were grouped together, designated as regular users, and assigned to Level of Implementation 3.

Reassignment of teachers and students. Based upon the reclassification of classrooms (teachers) according to levels of implementation of the independent learning system, the data analysis plan included three groups:

- Level of Implementation 1: Non-use of the independent learning system in the classroom
- Level of Implementation 2: Use of the independent learning system with only the six target students.
- Level of Implementation 3: Regular use of the independent Learning system with 50 percent or more of the students in the class.

Table 7 reports the number of teachers assigned to Levels of Implementation 1, 2, and 3 by grade and treatment group. By regrouping classrooms on the basis of level of implementation, one treatment teacher was identified who did not implement the system at all and five treatment teachers who used the system only with target students were found. In addition, four control group teachers were found to have been using independent learning with most of the students in their classroom.

TABLE 7

Number of Teachers by Level of Implementation,
Grade, Treatment/Control Group

Grade	Level 1		Level 2		Level 3	
	Treatment	Control	Treatment	Control	Treatment	Control
4	0	8	1	0	7	2
5	0	10	2	0	3	1
6	0	7	1	0	7	1
Combined Grade	1	0	1	0	0	0
Subtotal	1	25	5	0	17	4
TOTAL	26		5		21	

Table 8 shows the number of target students in each level of implementation group by grade and treatment group. The results reported in Chapter Four are based upon the grouping of teachers and target students by these levels of implementation.

TABLE 8
 Number of Target Students by Grade
 Level of Implementation, and Treatment/Control Group

Grade	Level 1		Level 2		Level 3	
	Treatment	Control	Treatment	Control	Treatment	Control
4	0	89	12	0	76	14
5	8	115	22	0	36	12
6	0	81	20	0	76	12
Subtotal	8	285	54	0	188	38
TOTAL	293		54		226	

STATISTICAL PROCEDURES

The classroom implementation phase of the study sought answers to four questions (see Chapter One). The statistical procedures used to investigate these questions are described below in two sections. The first describes the methods used to investigate research question one. The second section describes the procedures used to investigate student outcomes as stated in research questions two through four.

Classroom Organization and Activities

The first research question was investigated in order to describe classrooms in the three level of implementation groups and to determine if the three groups of classrooms could be distinguished by teacher and student activities. Two process measures, the classroom observation and

the student interview, provided information on instructional activities related to independent learning. Descriptions of the observation and interview measures are presented in Chapter Three.

The variables of interest in the classroom observations were: teacher activity, number of activity groups, amount of student influence in determining learning, number of students engaged by the teacher, number of adults engaged in instruction, and the ability of the student to identify a learning objective, end product, and deadline for independent projects.

Each variable was addressed by one observation and/or interview item. Each of these items included two to five reporting categories. Frequency counts were made on the number of times a reporting category within an item occurred in each classroom. Since the number of observations and interviews varied across classrooms, these frequencies were converted to proportions. The proportion of times a reporting category was used to describe a classroom was found by the ratio:

$$\frac{\text{Number of times reporting category chosen}}{\text{Number of times item was observed}}$$

Thus, when the proportions for each reporting category subsumed under an interview or observation item were added, the sum was 1.00.

Arc sin transformations of the proportions for each reporting category were obtained in an attempt to stabilize the variances of the variables within level of implementation group. Due to the ipsative nature of the observation reporting categories, transformed proportions for $n-1$ categories were used in the analyses where n is the number of reporting categories. For dichotomous items, the transformed variables were used in a one way ANOVA with groups defined by level of implementation. In

items with more than two response categories, the transformed variables were used as dependent variables in a discriminant analysis, with groups defined by level of implementation.

For the interview items, the proportion of times response categories were used to describe classrooms was reported for each level of implementation group. This information was used for descriptive purposes. No other analyses were performed on the interview data.

Student Outcomes

As indicated previously, practical problems of attrition and of dilution of the differences between treatment and control groups due to failure of implementation by treatment teachers and the use of independent study techniques by control teachers were serious enough that a lack of treatment effects was almost a foregone conclusion given a treatment/control group design. The introduction of the level of implementation variable was an attempt to deal with the problem of dilution of the differences between treatment groups. In this way, it was hoped that differences on student outcome variables above what might be expected on the basis of pretest variables might be associated with level of implementation.

The cost of moving from the treatment/control design variables to level of implementation was the loss of the initial experimental design with its associated logical and statistical power for unambiguously establishing effects. With the shift to level of implementation as the primary variable of interest, the data analyses are most appropriately interpreted within the context of quasi-experimental or survey research rather than experimental research. One of the difficulties introduced by this shift

is the loss of randomization even at the school level and a possible confounding of student input measures with the major "quasi-treatment" variable--level of implementation. As a consequence, the association of level of implementation with an outcome measure cannot be interpreted directly since it consists not only of a component that is unique to level of implementation but a component that is shared with input measures which is often referred to as the joint component (see for example, Beaton, 1973; Mayeske, Okada, Beaton, Cohen, and Wisler, 1973).

With confounded variables, the attribution of an effect to any one variable or to a set of variables becomes somewhat problematic. Path analysis and commonality analysis (Beaton, 1973) each provide a partial solution to the problem within the context of a linear model. For this study, path analytic procedures were not deemed to be of much potential value because of the relatively large number of variables that might need to be included and the lack of a clearly defined model for which the relatively strong assumptions required for a path analysis seemed tenable.

Commonality analysis, which attempts to divide the proportion of predictable variance on an outcome measure into portions that are unique to each variable and portions that are attributed jointly to each possible combination of variables, seemed closer to what was needed in this study. The analysis procedure that was finally selected is closely related to commonality analyses in that differences in squared multiple correlations are used to estimate the potential impact of a cluster of variables that cannot be explained on the basis of other sets of variables.

Although similar in some respects, the analyses that were conducted differ from the usual commonality analysis in several ways:

1. Clusters of variables were treated as sets rather than trying to get at contributions of individual variables.
2. The clusters of variables were treated sequentially so that estimates of the increment associated with a given cluster of variables included not only the unique contribution of that cluster but the joint contributions of variables in that cluster with variables in subsequent clusters.
3. No attempt was made to get separate estimates of joint components within or across clusters.

The decision to deal with clusters rather than individual variables was based on the realization that the potential number of predictor variables was quite large and that they naturally fall into a few broad categories. The first obvious category was student input which would include measures of the students that were obtained at the time of the pretest. Throughout the remainder of this report, student input variables are referred to as Cluster 1. The second natural cluster of variables consisted of the "quasi-treatment" variables, the main one of which was level of implementation. Also included in Cluster 2, however, was a dummy variable coded 1 for target students and 0 for nontarget students.

With just these two clusters of variables, a complete commonality analysis at the cluster level would include an estimate of the unique contribution to the squared multiple correlation associated with each cluster and a joint term which is that portion of the predictable variance that cannot be attributed uniquely to either variable due to confounding of the variables across clusters. In terms of squared multiple correlations the uniqueness of Cluster 2, $U(2)$, would be

$$U(2) = SMC(1,2) - SMC(1)$$

where $SMC(1)$ and $SMC(1,2)$ are respectively the squared multiple correlations obtained when a given outcome is predicted from the set of variables in Cluster 1 and by the set of variables in Clusters 1 and 2 combined. Similarly, the uniqueness for Cluster 1, $U(1)$, would be given by

$$U(1) = SMC(1,2) - SMC(2)$$

and the joint term for Clusters 1 and 2, $J(1,2)$, would be given by

$$J(1,2) = SMC(1,2) - U(1) - U(2).$$

Unfortunately, the joint term cannot be interpreted directly as a proportion of predictable variance. In fact, it may even be negative. Furthermore, the primary interest is in $U(2)$ since that cluster consists of the "quasi-treatment" variables. Thus, in the analyses reported in Chapter Four, it was decided that the squared multiple correlation for Clusters 1 and 2 would be partitioned into only two parts: that part which was predictable from Cluster 1 alone and that increment which was obtained by adding the variables in Cluster 2 to the regression equation. Thus, the increment associated with Cluster 1, $I(1)$, is simply

$$I(1) = SMC(1),$$

and the increment associated with Cluster (2), $I(2)$, is

$$I(2) = SMC(1,2) - SMC(1).$$

As can be seen with only two clusters of variables, $U(2)$ and $I(2)$ are identical and $I(1)$ is equal to $U(1)$ plus $J(1,2)$. In this study, there were actually more than two clusters, however, and with more than two clusters the correspondence between the sequential partitioning of the predictable variance and the commonality analysis is not so direct.

In addition to Clusters 1 and 2, in the present study there was an interest in exploring the possibility of interactions between level of

implementation and student input. To do this a third cluster of variables was introduced. This consisted of the cross-product of the level of implementation and a student's pretest score on the Level of Independence and the cross product of level of implementation and verbal ability. It was thought that this cluster would provide at least a partial check on the possibility of "aptitude-treatment" interactions. Wherever this increment associated with Cluster 3 was significant, more detailed analyses of the regression of the outcome variable on variables in Cluster 1 were conducted within each level of implementation. These analyses are described in greater detail below.

In addition to the input variables (Cluster 1), the "quasi-treatment" variables (Cluster 2), and the cross-product variables (Cluster 3), a fourth cluster of variables was identified. Cluster 4 consisted of the four scores on the Classroom Climate Instrument and generally one or two selected posttest variables. All the variables in Cluster 4 were thought to be, in part, measures of classroom process. Since they were obtained from students at the time of the posttest, however, they could also be interpreted as outcome measures. The inclusion of Cluster 4 as predictors in the regression analyses was intended only to provide a potential source of leads to possibly important process variables. A substantial increment associated with Cluster 4 would suggest the possibility of important process differences. However, Cluster 4 also could be interpreted in other ways. For example, the direction of the relationship between variables in Cluster 4 and an outcome measure is problematic. Cluster 4 was included in the analyses for purely exploratory purposes in the hopes of generating hypotheses for future work. Due to the sequential nature of the analyses, the inclusion

of Cluster 4 could not influence the results for the first three clusters since the increment associated with any given cluster of variables was estimated without regard to variables in subsequent clusters. Cluster 4 was always analyzed last.

In summary, for most outcome measures there were four clusters of predictor variables. The increment associated with each cluster was obtained by calculating the difference between the squared multiple correlation for all clusters up to and including the one in question and the squared multiple correlation for all variables up to and including the preceding cluster. The specific differences in squared multiple correlations used to calculate the increment associated with each cluster are summarized below.

<u>Cluster</u>	<u>Increment</u>
1	SMC(1)
2	SMC(1,2) - SMC(1)
3	SMC(1,2,3) - SMC(1,2)
4	SMC(1,2,3,4) - SMC(1,2,3)

The statistical significance of a given increment was tested by standard procedures. For example, an F-ratio to test the significance of the increment in Cluster 2 would be

$$F = \frac{[2SMC(1,2) - SMC(1)]k_2}{[1 - SMC(1,2)]/(N-k_1-k_2-1)}$$

where k_1 is the number of variables in Cluster 1, k_2 is the number of variables in Cluster 2, and N is the sample size. The F is distributed on k_2 and $N-k_1-k_2-1$ degrees of freedom.*

* For further information, see Kerlinger, F., and Pedhazur, E. Multiple Regression in Behavioral Research. New York: Holt, Rinehart and Winston, 1973.

The primary difficulty in interpreting an F statistic such as the one above is that while students were treated as the unit of analysis in the regressions, they are not strictly speaking the appropriate unit. It might be argued for purposes of this study that the most appropriate unit is the classroom since students within some classrooms were not treated independently. Certainly, significance tests based on students as the unit must be viewed with caution since they are based on assumptions of experimental independence of the units which are not actually satisfied. In the results presented in Chapter Four, therefore, the significance tests are used only as rough guides rather than as the basis for traditional probabilistic interpretations.

As previously noted, whenever a sizeable increment associated with the interaction cluster was observed, additional analyses were conducted to explore the possibility of an interaction between level of implementation and a student pretest variable. This was done by regressing the outcome variable in question on individual variables in Cluster 1 within each level of implementation. The hypothesis that the within level of implementation regression lines were parallel was then tested. Where the hypothesis of parallelism was rejected, the regression lines within level of implementation were plotted to display the nature of the interaction.

Summary

Three types of statistical procedures were used in the classroom implementation phase of the study. For purposes of determining if classrooms at various levels of implementation of the independent learning system could be distinguished by teacher and student activities, a one-way

ANOVA was employed with dichotomous observation items. A discriminant analysis was used for observation items with more than two response categories. Student outcome differences based upon levels of implementation of the independent learning system were investigated using an adapted form of commonality analysis.

CHAPTER THREE

DEPENDENT AND INDEPENDENT VARIABLES AND MEASURES

In order to study the effects upon students of the independent learning system, two types of variables were investigated: (1) student variables and (2) process variables related to maintenance of treatment conditions.

STUDENT VARIABLES AND INSTRUMENTS

Two types of student variables were of interest in the study. These were: (1) outcome variables that might be affected by participation in the treatment and (2) antecedent variables--traits and abilities--which might influence the effectiveness of the treatment. A total of six outcome variables and two antecedent variables were studied. Table 9 lists the variables and instruments in each category and indicates to whom and when the instruments were administered. Pretesting was conducted in late September and early October, 1974; mid-testing, in late January, 1975; posttesting, in late April and early May, 1975. Testing that involved paper and pencil instruments was scheduled in two one-hour sessions; one on each of two consecutive days. The fall schedule included the social studies achievement, work study skills, and verbal ability instruments along with one self-concept and attitude questionnaire. The spring schedule included social studies achievement, work study skills, and the social climate questionnaire (a process measure used in the study). Measures of the other variables were obtained through separately scheduled interviews and through evaluation of the products prepared by the students as part of

TABLE 9

Phase II Study Variables and Instruments

Variable	Instrument	No. of Items	Administered to	Point of Administration		
				Pre	Mid	Post
<u>Outcome Variables</u>						
Social Studies Achievement	Social Studies Achievement Test	20	All students*	X		X
Use of Reference Materials	Work Study Skills Instrument	30	All students	X		X
Self Concept	Self-Concept Questionnaire	24	All students	X		X
Attitude toward: schooling teacher learning social studies self	Student Attitude Questionnaire	12 11 9 10 20	All students	X		X
Level of Independence	Level of Independence Interview - Part II	4	All students Target students	X	X	X
Performance on Independent Learning Task	Product Evaluation	N/A	Sample of Target students			X
<u>Antecedent Variables</u>						
Verbal Ability	Short Test of Educational Ability	40	All students	X		
Background Information	Level of Independence Interview - Part I	4	All students Target students	X	X	

* "All students" refers to all the students in classrooms of participating teachers, whether or not selected as target/nontarget study participants.

their regular classroom activities. Except where noted, the tests were group administered to all students in a classroom. However, for data analysis purposes, only target/nontarget student data were used.

The description of the instruments which follows includes summaries of the psychometric properties of each instrument based on the study sample. For more detailed information, the reader is referred to Volume II which provides a correlation matrix of student variables and item statistics on all student instruments. Copies of the instruments and scoring keys can be found in Volume III.

Measures of Student Outcome Variables

For purposes of the Phase II Study, outcome variables were those student variables which might be affected by the treatment. Cognitive, affective, and independent study variables were of interest. The instruments used to measure each are described below.

Cognitive Measures

Two achievement instruments, Social Studies Achievement and Work Study Skills, were used to measure cognitive variables.

Social Studies Achievement Test. While there was no reason to expect that social studies achievement as measured by standardized test items would be affected, either positively or negatively, by experience in the independent learning system, the variable was included to detect an increase or decrease in performance if one were to occur.

A review was made of a large number of existing social studies achievement tests, reflecting varying opinions about what constitutes social studies and social studies achievement. To assure a fair measure of social studies

achievement as defined by the Los Angeles City Unified School District, it was decided to develop a test based on the "official" fourth, fifth and sixth grade social studies objectives of the district.

From lists of approximately 15 objectives per grade level, 8 fourth grade, 9 fifth grade, and 8 sixth grade objectives were selected by experts to be representative of the objectives at each grade level. The 25 objectives were then sent to the Westinghouse Learning Corporation (WLC), where two items measuring each objective were selected from a pool of 823 social studies items. The 50 items generated by WLC were reviewed for clarity and congruence with the school district objectives, and 20 multiple choice items, each addressing a different objective, were selected. Some items were reworded to be more easily understood by fourth grade students.

The Social Studies Achievement test was administered to all students in each classroom during pretesting in September, 1974, and posttesting in April, 1975. Students read the items themselves and marked answers in their booklets. The means, standard deviations, Cronbach's alpha, standard error of measurement, and number of students for the fourth, fifth, and sixth grade study sample (target/nontarget, treatment/control) are presented in Table 10 for both the pre and posttest administration. A copy of the instrument is included in Volume III.

Work Study Skills Instrument. The Minicourse 15 independent learning system emphasizes use of a variety of resources in carrying out independent contracts (projects). It therefore was hypothesized that students who regularly engaged in such independent learning would develop their ability to use reference materials.

TABLE 10
Social Studies Achievement Test
Psychometric Data
Target and Nontarget Students

Grade	Pre					Post				
	$\bar{X}$	S.D.	α	E.M.	N*	$\bar{X}$	S.D.	α	E.M.	N
4	8.27	3.67	.73	1.91	191	10.15	3.59	.70	1.96	191
5	10.71	3.68	.71	1.98	196	11.79	3.65	.72	1.94	196
6	12.22	3.53	.70	1.92	192	13.27	3.34	.69	1.86	192

* In this and subsequent tables, N represents the final sample on which data analyses were run (i.e., all target/nontarget, treatment/control students in the mid and high SES groups for whom both pre and posttest scores were available).

The W-3 subscale of the Iowa Test of Basic Skills was used to measure students' knowledge about and use of reference materials. This test was found to be the best available because of its content, reported validity, ease of administration, and appropriateness for grades 4-6.

Because the scale required more time than was available for testing and because project staff felt that the format of some items was confusing, a sampling of items was chosen for use in the study. Thirty multiple choice items taken from the complete W-3 subscale comprised the Work Studies Skills Instrument. The items measured understanding and use of tables of contents, indexes, encyclopedias, general reference materials, and key words.

The test was administered to all students during the pre and post-testing. Students read the items themselves and marked responses in

their test booklets. A summary of the psychometric properties of this instrument, based on the study sample, is presented in Table 11. A copy of the instrument and scoring instructions are included in Volume III.

TABLE 11
Work Study Skills Test
Psychometric Data
Target and Nontarget Students

Grade	Pre					Post				
	$\bar{X}$	S.D.	α	E.M.	N	$\bar{X}$	S.D.	α	E.M.	N
4	10.18	4.33	.70	2.38	191	13.81	5.22	.78	2.42	191
5	13.93	5.28	.78	2.45	196	16.22	5.74	.83	2.39	196
6	16.36	6.11	.85	2.38	192	18.86	5.79	.84	2.29	192

Affective Measures

Two attitude instruments, the Self-Concept Questionnaire and the Student Attitude Questionnaire, were used to measure affective variables.

Self-Concept Questionnaire. For purposes of this study, self-concept with regard to learning and school behaviors was emphasized. The Self-Concept Questionnaire used in the study contained 20 items selected from the 1966 version of the Sears Self-Concept Inventory. The items covered three areas of self-concept: convergent mental ability, divergent mental ability, and work habits. The total score on the 20 items provided a measure of self-concept in relation to school and learning activities.

The items were read to the students. They were directed to follow as each item was read and then answer the question, "Compared with other boys and girls my age, how do I compare?" Responses were marked on a five-point scale ranging from "excellent" to "not so good."

Prior to using the modified instrument in the study, a pilot test was run with 75 students from grades 4, 5, and 6. The results indicated that the instrument could be understood by students at these grade levels and that approximately 15 minutes was required to complete all items. The pilot data yielded a Cronbach's alpha coefficient of 0.91.

In the Independent Learning Study, the Self-Concept Questionnaire was administered to all students during the pre and posttesting. It was read aloud as students followed and marked answers in their test booklets. The pre and posttest means, standard deviations, alpha and error of measurement for each grade of the study sample are reported in Table 12. A copy of the instrument is included in Volume III.

TABLE 12
Self-Concept Questionnaire
Psychometric Data
Target and Nontarget Students

Grade	Pre					Post				
	$\bar{X}$	S.D.	α	E.M.	N	$\bar{X}$	S.D.	α	E.M.	N
4	69.36	12.95	.87	4.75	191	69.96	14.05	.89	4.56	191
5	69.07	15.14	.92	4.41	196	67.15	14.42	.91	4.38	195
6	67.70	14.10	.91	4.18	192	65.52	13.83	.91	4.06	192

Student Attitude Questionnaire. Several studies of open education programs (e.g., Traub, et al., 1973; Heimgartner, 1972) suggest that students' attitudes become more positive as a result of participation in these programs. Since the independent learning system established in the present study incorporated several features of open education, in particular self-directed learning, student attitude was included as an outcome variable.

The Student Attitude Questionnaire was designed by Far West Laboratory staff to measure six affective variables. The six variables, each measured by a separate subscale, were:

1. Attitude toward teacher--one's subjective feelings about teacher behavior especially with respect to the interpersonal relationship of teacher to pupils (11 items).
2. Attitude toward schooling--one's general orientation toward schooling, independent of a particular school (12 items).
3. Attitude toward learning--one's attitude toward the learning experience, independent of attitude toward school and teachers, as reflected in intellectual curiosity, willingness to study, volunteerism, and interest in problem solving (9 items).
4. Attitude toward social studies--one's feelings about the activities and content of instruction in social studies. This particular subject area was included since the treatment was administered in social studies (10 items).
5. Self-concept--student self-evaluation in relation to learning activities (20 items).
6. Independence--the extent to which students make decisions on their own, stand up for their rights, and act independently of others (7 items).

The items comprising the attitude toward teacher, schooling, and learning subscales were revisions of items found in Instructional Objectives Instruments (Traub et al., 1973a). The attitude toward social studies and independence subscales were modifications of items developed by the Educational Evaluation Center (1973). The self-concept items were selected

from those found in Liddle, Rockwell, and Sacadat (1967). Items were selected from these sources on the basis of their face and construct validity, appropriateness for use with fourth through six grade students, and evidence of reliability. They were randomly ordered within the instrument and placed in a Likert-type scale format. Students were instructed to indicate the extent to which they agreed with the statement in an item by circling their answers on a four-point scale ranging from "strongly agree" to "strongly disagree." The Student Attitude Questionnaire was administered pre and post to all students. It was read to the students as they followed and marked answers in their test booklets.

In order to determine if the grouping of items into the six subscales could be replicated empirically, a factor analysis of the 69 test items was performed on the pretest data. Fifteen factors were found. A list of the items in each scale and their factor loadings on the first 10 factors are presented in Appendix D of this volume.

The first factor was defined by items from the Attitude Toward Schooling Subscale and represented a positive attitude toward school. Each of the 11 items in this scale had a high ($>.60$) loading on factor 1 and low ($<.26$) on all other factors. The second factor was comprised primarily of self-concept items. Seven of the twenty self-concept items, representing attitudes toward self as compared to classmates, defined this factor. A second self-concept factor (factor 8) was found representing a low self-concept in relation to school work. Eight of the self-concept items reflecting difficulty in school defined this second self-concept factor.

Items loading high on the third factor and low on all others were the attitude toward teacher items. This factor represented a positive attitude

toward teacher. The fourth factor was made up of items from the social studies subscale and reflected a positive attitude toward social studies.

Thus, four of the attitude subscales--schooling, self-concept, teacher, and social studies--were found to define the first four factors. In addition, a second self-concept factor was found in factor 8. The remaining subscales--attitude toward learning and independence--did not define unique factors. Six of the nine attitude toward learning items had high ($>.40$) loading on factor 1. Since these items concerned studying and learning in school, they were similar to the attitude toward school items which defined factor 1.

The seven independence items had their highest factor loadings on six different factors and low loadings on all other factors. Only two of the independence items could be included in factors previously defined. One item, stating a positive attitude about doing school work independently, had a loading of .34 in factor 1--attitude toward school. The second, indicating some difficulty in working independently, was found in the second self-concept factor and was similar to items in that factor.

Since the factor analysis did not support grouping the independence items into a unique subscale or into any previously defined subscale, a decision was made to drop these items from further analysis.

Summaries of the psychometric properties for the remaining five subscales based on the target/nontarget, treatment/control study sample are presented in Table 13. Intercorrelations among the subscales for each grade level are presented in Table 14. Inasmuch as the student attitude questionnaire included a self-concept subscale, it also is interesting to note the correlation between this measure and the self-concept questionnaire.

TABLE 13

Student Attitude Questionnaire
Psychometric Data
Target and Nontarget Students

Grade	$\bar{X}$	S.D.	Pre α	E.M.	N	$\bar{X}$	S.D.	Post α	E.M.	N
<u>Attitude Toward Teacher (11 Items)</u>										
4	33.70	5.5	.74	2.82	191	33.05	6.63	.85	2.54	191
5	33.76	5.24	.78	2.44	196	32.62	5.80	.82	2.47	196
6	33.76	4.98	.79	2.29	192	31.35	6.11	.86	2.25	192
<u>Attitude Toward Schooling (12 Items)</u>										
4	33.95	9.25	.90	2.88	191	33.90	9.64	.93	2.58	191
5	34.16	8.02	.91	2.37	196	33.68	8.64	.92	2.40	196
6	33.05	8.36	.92	2.41	192	31.19	8.01	.92	2.31	192
<u>Attitude Toward Learning (9 Items)</u>										
4	27.77	4.42	.65	2.62	191	27.80	4.42	.69	2.46	191
5	27.71	4.40	.73	2.27	196	27.72	4.46	.74	2.27	196
6	27.73	4.13	.72	2.19	192	26.78	3.90	.69	2.18	192
<u>Attitude Toward Social Studies (10 Items)</u>										
4	28.72	5.45	.77	2.59	191	29.41	5.85	.83	2.40	191
5	28.37	4.87	.79	2.23	196	27.97	5.95	.85	2.30	196
6	27.02	5.79	.86	2.20	192	26.27	5.79	.86	2.14	192
<u>Self Concept (20 Items)</u>										
4	59.07	7.99	.79	3.66	191	58.87	9.27	.87	3.37	191
5	58.24	7.70	.83	3.18	196	55.82	8.25	.86	3.12	196
6	58.73	8.43	.87	3.07	192	58.23	7.06	.82	2.96	192

TABLE 14
Student Attitude Questionnaire
Subscale Intercorrelations

Grade 4									
Attitude Toward:	Teacher Post	Schooling Pre	Schooling Post	Learning Pre	Learning Post	Social Studies Pre	Social Studies Post	Self-Concept Pre	Self-Concept Post
Teacher Pre	.350	.514	.275	.539	.277	.258	.132	.297	.253
Teacher Post		.314	.597	.214	.518	.084	.395	.057	.251
Schooling Pre			.564	.700	.429	.573	.170	.086	.104
Schooling Post				.358	.735	.329	.456	.066	.269
Learning Pre					.452	.479	.260	.315	.377
Learning Post						.302	.590	.202	.512
Social Studies Pre							.214	.103	.082
Social Studies Post								.223	.383
Self-Concept Pre									.591
Grade 5									
Teacher Pre	.524	.401	.288	.485	.230	.272	.196	.322	.149
Teacher Post		.287	.532	.290	.463	.184	.337	.187	.289
Schooling Pre			.668	.746	.528	.563	.253	.401	.260
Schooling Post				.492	.709	.378	.464	.301	.388
Learning Pre					.509	.577	.244	.458	.260
Learning Post						.440	.593	.320	.362
Social Studies Pre							.443	.232	.122
Social Studies Post								.047	.175
Self-Concept Pre									.630
Grade 6									
Teacher Pre	.248	.351	.159	.327	.211	.248	.022	.373	.133
Teacher Post		.035	.412	-.001	.420	.018	.266	.020	.224
Schooling Pre			.513	.735	.461	.554	.233	.377	.236
Schooling Post				.439	.771	.295	.513	.146	.335
Learning Pre					.522	.588	.269	.458	.245
Learning Post						.373	.539	.211	.313
Social Studies Pre							.508	.353	.242
Social Studies Post								.106	.218
Self-Concept Pre									.666

For grade 4, the student attitude self-concept subscale pre measure correlated .511 with the self-concept questionnaire pre and .4846 with the questionnaire post measure. The subscale post measure correlated .405 with the self-concept questionnaire pre measure and .626 with the post measure. For grade 5, the student attitude self-concept subscale pre measure correlations were .644 and .516 with the self-concept questionnaire pre and post measures respectively. The subscale post measure correlated .432 and .567 with the questionnaire pre and post measures. For grade 6, the student attitude self-concept subscale pre measure correlated .613 and .554 with the self-concept questionnaire and post measure. This subscale post measure correlated .556 and .652 with the questionnaire pre and post measures respectively.

Independent Study Measures

The independent learning treatment was designed to increase students' skill in working independently, in defining and selecting their own learning tasks, and in using a variety of resources when completing a learning project. Two measures of student performance in outcome areas directly related to these skills were used: (1) a measure of a student's level of independence, the Level of Independence Interview, Part II, which was applied pre and post and (2) a procedure of student product evaluation which was used during the posttesting period. A discussion follows of both these measures. Inasmuch as the measures required interviewer and rater training, information regarding the training procedures also is included.

Level of Independence Interview--Part II. The level of Independence Interview, developed by Far West Laboratory staff, contained two parts. Part I obtained student background data. Part II, which was used to obtain

student level of independence data, was designed to measure the student's Level of Independence (LOI) or the degree to which a student could work independently. The questions in Part II were based on the assessment methods taught in Minicourse 15 and sought information about the four LOI assessing areas described in the course: (1) identifying a study topic, (2) outlining the steps to follow in completing a project, (3) identifying resources, and (4) establishing a deadline. Both parts were combined into a single one-to-one interview.

In the LOI portion of the interview, students were presented with a general social studies topic and asked to describe how they would carry out an independent project on this topic. Answers to this line of questioning provided information about independence in areas 2, 3, 4. Interviewers probed for and coded the steps a student proposed using to complete a project, the number and types of resources the student mentioned, and whether or not the student was able to estimate the time he would require to complete the project. In order to measure skill in identifying a study topic (area 1), students were asked what they would like to study in an independent project in social studies. Their answers were coded according to the specificity of the topic they identified.

Scores were obtained for each of the four areas depending on the nature of the student's responses and whether they were given before or after a probing question. (See Volume III for scoring key.) The maximum score for each of the four LOI areas was 3. The overall level of independence was represented by the sum of the four area scores so that 12 was the highest possible LOI score.

103

The LOI interview was piloted on six occasions in the spring and summer of 1974 prior to its use in the study. Test-retest reliability was investigated by interviewing 12 students in April, 1974, and again in May, 1974. Of the 12 students, 8 received the same overall rating on both occasions, while 3 received a higher overall rating on the second interview. The increase in overall rating was a result of the students' greater specificity during the second interview in identifying a topic area.

Interrater reliability was investigated during the piloting by having two staff members interview the same student, one after another. Fifteen students were interviewed. The percentage of agreement of the two interviewers for each area were: identifying a topic, 87%; outlining steps, 73%; identifying resources, 73%; and establishing a deadline, 53%. The agreement on overall LOI was 73%. After this piloting, more specific rules for coding the fourth area, establishing a deadline, were developed and applied, resulting in a higher percentage of agreement on this area and agreement on overall level of independence of 87%.

During the study reported herein, the LOI interview was administered three times: to all students during the pre and posttesting and, in addition, to target students during the mid-year testing cycle. Table 15 summarizes the psychometric properties of the instrument for the study sample at pre, mid, and post administrations.

Interviewers were trained in the use of the LOI interview before pre-testing and were retrained before the mid and posttesting cycle. The following discussion describes both the training and the methods used in assessing agreement among interviewers.

(1) Pretest training. The LOI interview training took approximately three days. On the first training day, the LOI interview schedule and coding guidelines were presented. Following a discussion of the interview's

TABLE 15
Level of Independence
Psychometric Data

Grade	Pre--Target & Nontarget Students					Mid--Target Students					Post--Target & Nontarget Students				
	$\bar{X}$	S.D.	α	E.M.	N	$\bar{X}$	S.D.	α	E.M.	N	$\bar{X}$	S.D.	α	E.M.	N
4	7.42	1.96	.59	1.25	191	8.61	1.81	.52	1.24	101	8.90	1.37	.21	1.23	191
5	7.77	1.85	.46	1.36	196	8.68	1.30	.00	1.30	97	9.18	1.55	.40	1.20	195
6	8.19	1.87	.52	1.30	192	9.07	1.61	.49	1.15	95	9.61	1.44	.40	1.12	192

purpose and use, the interviewers watched two project staff members role play interview situations. The importance of using the specific questions and probes presented in the interview schedule was stressed. Procedures for recording student responses also were explained and studied through the roleplaying situation. Interviewers then interviewed each other and practiced coding responses while three staff members circulated among them to observe and answer questions.

The second day, interviewers and staff members met at a San Fernando Valley (California) school. While not a participating school, it was similar to the mid-SES schools in the study. Interviewers worked in pairs to practice interviewing students. While one trainee interviewed a student, both coded the student's responses; the interviewers then compared coding after each interview. Four staff members circulated among the interviewers to observe and offer suggestions. Approximately four practice interviews were completed by each interviewer, with a group meeting mid-day to discuss questions and problems.

The third day of training was used to review ground rules and to assess the accuracy of the interviewer's coding. Interviewers were given six dialogues developed from student interviews and asked to code the students' answers. A scoring key for each dialogue was developed and agreed upon by four staff members and used to score each interviewer on the six dialogues. Results are shown in Table 16. The two interviewers who did not reach 80% agreement with the key on at least five dialogues were given additional individual training. When retested, these interviewers reached at least 80% agreement with the key.

TABLE 16
Coding Reliability of Interviewers on Six Test Dialogues

Interviewers	Dialogues					
	1	2	3	4	5	6
A	75*	90	100	90.9	100	100
B	75	90	100	90.9	90	100
C	75	100	100	90.9	80	100
D	75	80	100	90.9	70	100
E	87.5	90	100	90.9	90	100
F	87.5	90	100	100	100	100
G	87.5	90	100	100	100	100
H	100	90	100	81.8	100	100
I	62.5	70	62.5	72.7	90	90
J	75	80	75	81.8	90	90

* Scores are shown as percentage of agreement with a coding agreed upon by experts.

On the last day of training, a check also was made on the interviewers' accuracy in following the interview procedure. Each interviewer conducted two interviews with staff members playing the part of a student. So that all interviewers would receive the same responses, staff members had agreed on standard answers to the interview questions for both simulated interviews. The questioning procedures used by the interviewers were checked by the staff member being interviewed. All interviewers were found to be following the interview procedures and to be using appropriate probing techniques.

(2) Mid-test training. Since interviewers had used the LOI interview during pretesting, only one day of retraining was provided before mid-testing. After a review of the interview and coding procedures, interviewers practiced the interview with each other. To determine if they followed the interview schedule and to assess accuracy of coding, each interviewer interviewed a staff member. The staff member provided standard responses to the interview questions and checked the interviewer's coding against a scoring key. The accuracy of each interviewer's coding is shown in Table 17. All testers reached 100% agreement.

TABLE 17
Coding Reliability of LOI Interviewers
at Midtest and Posttest Training

Interviewer	Mid-test	Posttest ²
A	100 ¹	93.8
B	100	93.8
C	100	100
D	100	100
E	100	80
F	100	95
G	100	100

1. Scores are shown as percentage of agreement with a key.
2. Posttest scores are the average of two reliability tests.

(3) Posttest training. Since the seven interviewers working during the posttesting cycle had conducted LOI interviews in the pre or midtesting cycles, only a review of the interview and coding procedure was necessary. In order to test accuracy in coding, interviewers were asked to code student responses in two dialogues based on student interviews. Their coding was checked against a scoring key. Table 17 also shows the results of this test. All interviewers reached at least 80% agreement with the key.

Student product evaluation. The development and pilot testing of the student product evaluation procedure is described in detail in Nomos Institute Reports I and II (1975). The purpose of this procedure was to evaluate the end result of students' having engaged in an independent learning experience--in other words, to evaluate the products developed by the students. It was anticipated that these products would vary from written reports to multi-media displays and models. The evaluation system was intended to generate reliable quantitative data for use in assessing the effects of implementing an independent learning system on the quality of student outcomes of products.

The selection of an evaluation system was based on certain assumptions:

1. Student outcomes had to be expressed in a physical or product form, e.g., theatrical performances or recitations had to be audiotaped and could not be performed live.
2. A deadline for task completion had to exist.
3. The evaluation system could not be prohibitively expensive to operate.
4. Value judgments had to be made as to which attributes of products were relevant for evaluation.

The evaluation procedure selected was a modification of the psychophysical method known as paired-comparison. Paired-comparison is an evaluation method in which the criteria by which things are judged emerge from the relation of their perceived attributes, rather than from a prescribed set of externally based standards. As the Nomos staff indicated (Report No. I, 1975):

This type of methodology seems most relevant to the evaluation of pupil-products that are created under independent learning conditions. Since the a priori specification of standards of quality would be contrary to the basic idea of independent learning, evaluation procedures that have their foundation in psychophysical methods seem appropriate.

In the paired-comparison method, all objects to be evaluated are presented to judges in all possible pairs. Each judge then determines which pair member has more of a specific trait or dimension than the other. The results obtained by having several judges rate objects in this manner are expressed as the number and proportion of times an object is rated higher than each other object. These results are then used to scale the objects in terms of the trait being evaluated.

Because each object must be paired with every other object, the number of object pairs and thus the number of comparisons to be made becomes quite large. Guilford (1954) states that when the number of objects is greater than fifteen, comparing all possible pairs of objects becomes a long and tiresome task for the judges. He suggests reducing the number of pair comparisons by selecting a limited number of objects to act as standard objects. Objects are then paired with each standard, rather than with all other objects. The standard should be selected at approximately equal intervals along the psychological scale of the dimension used in comparing objects. There should also be a high degree of agreement as to the scale position of the standards.

This modification of the paired-comparison technique was used in evaluating student products in the Phase II study. Four dimensions--global quality, cognitive quality, originality, and use of resources--were evaluated. Table 18 presents the connotative meanings associated with each dimension.

The evaluation was performed in two cycles. First, all judges rated all products on a nine-point scale, once for each of the four dimensions. The product ratings resulting from this cycle were used to select five standard products for each dimension. In the second cycle, the judges compared all products to each of the five standard products. As in the first cycle, the pair-comparison cycle was completed four times, once for each dimension. A description of the specific procedures used in the evaluation follows.

(1) Selection of students for product evaluation. All target students in Phase II treatment and control classes (approximately 300 students) were required to prepare a final product for evaluation. In the treatment classes, it was assumed that the target students would complete these products based on independent study contracts. In the control classes, the teachers were free to assign the products as independent efforts or as small group efforts. Due to other curricular and time demands, many of the control class target students carried out their projects as additional independent activities that went beyond their regular social studies assignments. Some control target students did the projects as part of their regular social studies work. These products were to be completed during the period from April 1 to May 23, 1975. Since 300 products would be too cumbersome to process, even with the use of standard products, a sample of 104 students was chosen for product evaluation. The sample was selected before work on the product began, but

TABLE 18

Connotative Meanings Associated with
Each of the Four Product Evaluation Dimensions

<u>Dimension</u>	<u>Connotative Meanings</u>
1. Global Quality	Total characteristics of product; overall quality; quality as perceived on first impression; non-analytical judgment of quality; general aesthetic quality; general "goodness" or "badness"
2. Cognitive Quality	Level of intellectual activity apparent in product; accuracy of information contained in product; extent to which product required collection of information, discrimination between valid and invalid evidence, and reorganization and synthesis of information
3. Originality	Divergence from what is normally expected; shows unique characteristics; experiments with different forms of approaches; creativity; inventiveness
4. Use of a Variety of Resources	Product displays evidence of the use of many resources either in research for product or in the preparation of the product; use of resources other than books; use of observation or interviews; use of different media in execution of the product; use of community stimuli in product; use of people.

the teachers were not aware that only a sample of their target students' products would be evaluated.

To obtain a representative sample of products from among the 300 that were produced, two target students were randomly selected from each treatment and control class in the study to serve as the product evaluation subsample. In the high SES control category, these students were selected from only three classes in each of the four schools. This was done because there was a disproportionate number of participating classrooms in that category. The three classes were randomly selected in each school. These procedures resulted in a total sample of 104 student products.

In addition to the two sampled students, one target student was randomly selected in each class to act as an alternate. The product developed by the alternate was to be used if a sample student did not complete a product for evaluation.

(2) Collection and display of products. While the independent projects to be completed by the students were restricted to work in social studies, the products varied widely as to topic and relative specificity. Examples of topics represented among the products were: uniforms of the armed services from the Revolution to the Korean War; roads in California and Baja California; clothing of the United States and Japan; why bridges are built, including a comparison of California and New York bridges; schools in Mexico and the United States; comparison of the lives of two female adults through interviews; transportation in 1776 and 1976.

Students had approximately eight weeks between April 1 and May 23, 1975, in which to plan and complete their products. Products not completed by May 23 were not included in the evaluation. Student products were collected by project staff when they were completed.

Because some students did not finish their products on time and because some students worked together on projects thus requiring elimination of the product from the evaluation, the total number of products collected from sampled and/or alternate students was 88. Table 19 shows the number of products expected and the number actually collected from the treatment and control target students at each SES and grade level.

TABLE 19

Number of Products Expected and Obtained
for Treatment and Control Target Student Sample
by Grade and SES Level

SES	Grade	Treatment Students		Control Students	
		# Products Expected	# Products Obtained	# Products Expected	# Products Obtained
Low SES	4 5 6 Combined	8	6	4	3
Mid SES	4 5 6 Combined	8 2 6 4	5 2 5 4	10 10 2	7 7 0
High SES	4 5 6 Combined	8 8 10	10* 7 8	8 6 10	8 6 10
TOTAL		54	47	50	41

* Products of 2 alternate students were collected along with those of the sample students and were included in the evaluation.

For the evaluation process, student products were arranged on two long tables and three walls of a display classroom. The variety of products created some display problems since the collection included posters, murals, tape recordings, a mobile, models, and written reports. An attempt was made to arrange the display so that schools and classrooms were mixed. Once ordered, numbers from 1 to 88 were assigned the products and recorded in a log book along with a description of each product and the identification number of the student who produced it. Throughout the evaluation, product numbers were used for identification; all student, teacher, and school names appearing on the products were concealed. A log book was kept to assure the return of products to their owners and to convert product number to student identification number during analysis of the evaluation data.

(3) Selection of judges. Five data collectors who had worked with the Independent Learning Study throughout the year giving tests and conducting interviews and observations and who were available for full-time work during the evaluation period acted as judges. Although it was recognized that testers might identify a product and thus bias the ratings, personnel and budget constraints required their use as judges. Two steps were taken to reduce the chance of bias in the ratings. First, as stated earlier, all school, teacher, and student names appearing on products were covered. Second, judges were directed to note the product number of any product they had seen before. With 88 products on display, only a few--less than 5%--were recognized as belonging to particular classrooms.

(4) Identification of standard products. Training of the judges began with an introduction to the nine-point rating scale which was used

to identify standard products for each of the four product dimensions to be evaluated. A reference sheet providing connotative descriptions of each dimension was distributed to the judges (see Table 18).

In order to give the judges a "feel" for the dimensions, they were asked to quickly view the products in the display room, keeping in mind the dimensions they would use in rating. Only ten minutes was allowed for this first viewing so that the judges would not start their ratings.

A discussion of the four dimensions and the procedures for rating the products followed. Although general questions regarding the connotative descriptions of the dimensions were answered, specific questions requesting examples of "high" or "low" products were avoided. It was explained to the judges that providing criteria for their evaluations would negate the purpose of the evaluation method (the modified paired-comparison technique). Although somewhat uncomfortable with the task of rating products without specific criteria, the judges accepted the explanations provided and agreed to begin with the nine-point rating scale. The judges were to rate each of the 33 products on each dimension independently.

To avoid order effects in the ratings, it was necessary for each judge to rate the products in a unique sequence. Five different lists of the product numbers, randomly generated by computer, were used as the rating sequences. Each judge had a different random sequence of product numbers to follow in rating the products. An example of the nine-point rating sheet can be found in Volume III.

Four hours were required to complete the ratings of the first dimension, global quality -- a much longer period of time than had been estimated on the basis of piloting the evaluation procedure. Most of this time was

spent in the judges' becoming familiar with the products before rating them --reading reports, listening to tapes, and studying maps and posters. Nine-point ratings were made for the remaining three dimensions on the second day of evaluation. Judges rated products in a different sequence for each dimension. Since the judges were already familiar with the products, the time required for the last three dimensions (75, 35, and 15 minutes, respectively) was much less than for the first dimension.

The judges' ratings for each product were recorded on tally sheets, with separate tallies for each dimension. The median rating and the range of ratings were calculated for each product on each dimension. The tallying and calculations were completed by a team of project staff members and checked for accuracy by a second team of staff members. It should be noted here, as well as later in the paired-comparisons, that the order of rating of the dimensions was not varied among the judges. As a result, the extent to which ratings on previous dimensions influenced the rating the products received on the following dimensions is not known (e.g., the extent to which a judge's opinion regarding global quality affected the other ratings for a product). However, the random order of the initial ratings, the use of different standard products for each dimension during the paired-comparisons, and the random order of the paired-comparisons helped to alleviate this problem.

For each dimension, products were first ordered by median rating and then within median ratings, by range of ratings. (An ordered list of the products and their medians and ranges is presented in Volume II.) The ranking of products was used to select five standard products for each dimension for the paired-comparison cycle.

For each dimension, representative low score, middle score, and high score products with small ranges were identified as standard products one, three and five, respectively. Products with the lowest ranges and with medians at approximately equidistant intervals between the three standard products were identified as standards two and four. (A description of the standard products, their median ratings and ranges can be found in Volume II.)

(5) Paired-comparison cycle. Before starting the paired-comparison cycle for each dimension, the five standard products for that dimension were collected from the display and exhibited on a table at the front of the room. They were labeled as standards one through five and also were identified by their product numbers. A random order was used in displaying the products in order not to bias the judges' paired-comparison ratings. Although labeled one through five, the products were not in order of low to high score. The actual rank order of the standard products was known only by the project staff members and was indexed for use in data analysis.

Since judges were already familiar with the four dimensions on which ratings were to be made and had already reviewed the student products, the only training required for this second evaluation cycle was in making paired-comparisons. Judges were instructed to compare each product with every standard product. They were to determine if the product being rated exhibited more or less of the quality suggested by the dimension than the standard product. Before beginning each paired-comparison cycle, the judges were allowed a few minutes to study the standard products to get a feel for their quality in terms of the dimension to be evaluated.

As in the nine-point rating cycle, each judge had a unique sequence to follow in evaluating the products. An example of the coding sheet used for the paired-comparison cycle is provided in Volume III. Judges were directed to code a "1" if the product exhibited more of the quality being evaluated than the standard product and a "0" if it exhibited less of the quality. In cases in which a standard was paired with itself, an "x" was placed in the coding box. The judges made five paired-comparisons for each product, one with each standard product.

The paired-comparison cycle was completed four times, once for each dimension. When judges completed their comparisons on a dimension, the standard products were returned to their place in the display and the standard products for the next dimension were set in the front of the room. During each paired-comparison cycle, standard products were randomly ordered for display and judges received new sequences to follow in making their comparisons. The times required for the paired-comparison cycles were: Global Quality, 55 minutes; Cognitive Quality, 45 minutes; Originality, 40 minutes; and Use of Resources, 20 minutes.

(a) Scoring procedures. Data obtained for each dimension from the modified paired-comparison cycle consisted of five binary codings from each judge on every product. The five codings resulted from the comparison of a product with each of the five standard products for that dimension. As noted above, judges coded a "1" if the product exhibited more of the quality of that dimension than the standard and a "0" if it exhibited less of the quality.

A product score was derived by summing the number of 1's each judge coded for a given product. Since scores ranged from 0 to 5, summing the

scores for all five judges for that product resulted in a frequency score ranging from 0 to 25 (see Step 1 below). To recapitulate, the final frequency score for a product represented the number of instances among 25 possible comparisons (5 judges x 5 standards) that a particular product was selected as superior in quality to the standards for a specific dimension. The product scores then were transformed from frequencies into proportions by dividing through by the maximum number of comparisons or binary choices, i.e., 25 (see Step 2 below).

As an example, if a given product were judged superior to 4 of the 5 standard products by each of the five judges, the frequency score would be 20 (the sum of four 1's coded by each of five judges) and the proportion score would be .80 (twenty over twenty-five, 20/25). In other words, the product was viewed superior in 80% of all possible comparisons.

Steps 3, 4, 5 and 6 (see below) were used to transform the proportion score into a standardized difference score. The resultant product evaluation scores for each dimension were used as dependent variable measures.

The steps in the computation procedures are listed below:

1. From the combined rating data set, sum the number of times a product was rated higher than each standard product (Σf).
2. Calculate the mean proportions of "superior" judgments for each product

$$M_{p_1} = \frac{\Sigma f_1}{N \times n} = \frac{\Sigma f_1}{25}$$

where N = number of standard products

n = number of judges

3. Calculate the mean proportion of "superior" judgments for the dimension.

$$\bar{M}_p = \frac{\sum f}{KNn} = \frac{\sum f}{2200}$$

where k = number of products or 88.

4. Calculate the difference score (d_{p_k}) between the mean proportion for each product and the mean proportion for the dimension

$$d_{p_k} = M_{p_k} - \bar{M}_p$$

5. Convert d_{p_k} to the standard deviation unit z , on the normal curve through reference to a "Table of the Areas of the Normal Curve."
6. Multiply z by 10 and add 50 to find the product score. The difference scores then are standardized and have a mean of 50 and standard deviation of 10.

The data used in determining product scores and the intermediate calculations for each dimension are presented in Volume II.

(b) Interjudge reliability. Estimates of internal consistency were computed based on the paired-comparison data which were generated after the standard products were selected for each dimension. These reliability estimates were obtained utilizing a two stage procedure: (1) a check was made on the ordinality of the five standard products selected for each dimension and (2) an estimate of interjudge reliability was obtained through the use of analysis of variance on product scores.

In order to validate the ordinality of the standard products as originally determined with the 9-point rating data, an adaptation of Guttman's Scalogram Analysis (1950) was used. For any product evaluated on any dimension, each judge was required to make five comparisons or dichotomous choices, one with each of the five standard products. If the

ordinality of the standard products is perfect, then any product chosen higher than the highest, or fifth, standard would have been chosen higher than each of the four ordinally inferior standards. Having been chosen higher than all five standards, the product would be assigned a score of 5 for that judge. The expanded model is depicted in Table 20.

For a product to have a score of 4, it should be judged higher than standard four and all three ordinally inferior standards. To the extent that any product obtains a score of 1 through 4 with a dichotomous choice pattern not depicted in Table 20, the score is the result of the judge having made one or more errors in the series of five judgments and/or an indication of lack of ordinality among the standards for that dimension.

TABLE 20

Paradigm for Scalogram Analysis
Ideal Pattern of a Judge's Dichotomous Choices Reflecting
Perfect Internal Consistency in the Ordinal Scaling of the Standards
(e.g., Dimension 1, Judge 1)

Products (P)	Standards (S)					Score
	S ₁	S ₂	S ₃	S ₄	S ₅	
1	P ₁ >S ₁	P ₁ >S ₂	P ₁ >S ₃	P ₁ >S ₄	P ₁ >S ₅	5
2	P ₂ >S ₁	P ₂ >S ₂	P ₂ >S ₃	P ₂ >S ₄	P ₂ >S ₅	4
3	P ₃ >S ₁	P ₃ >S ₂	P ₃ >S ₃	P ₃ >S ₄	P ₃ >S ₅	3
4	P ₄ >S ₁	P ₄ >S ₂	P ₄ >S ₃	P ₄ >S ₄	P ₄ >S ₅	2
5	P ₅ >S ₁	P ₅ >S ₂	P ₅ >S ₃	P ₅ >S ₄	P ₅ >S ₅	1
6	P ₆ >S ₁	P ₆ >S ₂	P ₆ >S ₃	P ₆ >S ₄	P ₆ >S ₅	0
...						
R						

Guttman developed a coefficient of reproducibility as a means of expressing the amount of deviation from the ideal sequential pattern of choice. The formula for the coefficient is:

$$\text{coefficient of reproducibility} = 1 - \frac{\text{number of errors}}{\text{number of judgments}}$$

where

$$\text{number of judgments} = \text{number of standard products} \\ \times \text{number of products minus number} \\ \text{of standard products}$$

An adaptation of the coefficient of reproducibility was utilized in this study. The unit for computing the coefficient was the pattern over five judgments rather than individual judgments. In other words, the emphasis was on whether or not a pattern of five judgments was erroneous without regard to the number of errors occurring within the pattern. Therefore, the formula for the modified coefficient would be as follows:

$$\text{modified coefficient of reproducibility} = 1 - \frac{\text{number of erroneous patterns}}{\text{total number of products minus} \\ \text{number of standard products}}$$

Modified coefficients by judge and by dimensions are presented in Table 21.

A low modified coefficient of reproducibility indicates that the judge did not perceive the placement of the five standards on a continuous scale in the order determined by the first rating cycle. Thus, the judge's definition of a dimension or evaluation of a product's quality changed from the first to the second evaluation cycle. As can be seen in Table 21, Judge 5 was consistently lower than all other judges in the number of correct patterns. Although the ratings of this judge were somewhat at lower in reproducibility than desired, they were included in the data analyses.

124

TABLE 21
Modified Coefficient of Reproducibility
by Judge and Dimension

Judge	Dimensions			
	Global Quality	Cognitive Quality	Originality	Resources
1	.976	.988	.892	.880
2	1.00	.976	.952	.711
3	1.00	.831	.823	.880
4	.988	.988	1.00	1.00
5	.807	.775	.602	.468

Table 21 also illustrates that as one moves from the first dimension, global quality, to the last dimension, use of resources, the percentage of correct patterns decreases for most judges. This could suggest that the earlier dimensions were better understood by the judges than the later ones. Most likely, it is a reflection of the fatigue the judges experienced evaluating 38 products four different times during the first cycle, and then reviewing the same products four times during the second evaluation cycle, etc. Under the circumstances, it would not be surprising if the ratings of the last dimensions did not receive the same consideration as those of the first.

With the exception of Judge 5, coefficients of reproducibility were found to be acceptable for global and cognitive dimensions. However, sufficient inconsistency was demonstrated in the originality and resource dimensions to warrant extreme caution in their use and interpretation.

851
+57
125

For the global and cognitive dimensions, reproducibility of the judgments established an adequate level of internal consistency for using the judges' product scores as the data unit for establishing interjudge reliability. In spite of marginal scalogram findings, interjudge reliability also was estimated for a composite of the originality and resources scores.

Winer's analysis of variance model (1962, pp. 125-126) was used to obtain interjudge reliability coefficients. A schematic representation of Winer's model for any given dimension is presented in Table 22.

TABLE 22

Paradigm for Estimating Interjudge Reliability*
(e.g., Dimension 1 - Global)

Products	Judges					Total	Mean
	J ₁	J ₂	J ₃	J ₄	J ₅		
1	X ₁₁	X ₁₂	X ₁₃	X ₁₄	X ₁₅	ΣX_1	$\bar{X}_1$
2	X ₂₁	X ₂₂	X ₂₃	X ₂₄	X ₂₅	ΣX_2	$\bar{X}_2$
.							
k	X _{i1}	X _{i2}	X _{i3}	X _{i4}	X _{i5}	ΣX_i	$\bar{X}_i$

* Based on Winer's analysis of variance model (1962, pp. 125-126).

As applied in the Phase II study, judges have the role of treatments. The estimated reliability for the mean of five judges' scores for each product, therefore, was as follows:

$$r_{\text{judges}} = \frac{\text{Mean Square}_{\text{between products}} - \text{Mean Square}_{\text{within products}}}{\text{Mean Square}_{\text{between products}}}$$

$$= 1 - \frac{\text{Mean Square}_w}{\text{Mean Square}_b}$$

A second coefficient which reflects an adjustment for differences in the judges' frame of reference was included (Winer, 1962, pp. 128-129).

Reliability coefficients for each dimension are presented in Table 23.

They are acceptable.

TABLE 23

Estimated Interjudge Reliabilities
Student Product Evaluation

Dimension	r_{judges}	adjusted r
Global	.87	.87
Cognitive	.82	.83
Originality & Resources*	.89	.90

* Originality and Resources were combined for purposes of data analysis. A discussion of the reasons for combining these dimensions is presented in Chapter Seven.

(c) Intercorrelations between dimension ratings. As noted above, the procedures followed in the evaluation of the student products may have influenced the scores for the various dimensions and the interjudge reliability. The intercorrelations between the scores for the various dimensions, therefore, are of interest. These are presented in Table 24.

TABLE 24
Student Product Evaluation
Intercorrelations between Ratings

Ratings	Grade 4			
	Global Quality	Cognitive Quality	Originality	Variety of Resources
Global Quality		.606	.761	.743
Cognitive Quality			.323	.464
Originality				.878
Variety of Resources				
Grade 5				
Global Quality		.863	.792	.744
Cognitive Quality			.695	.741
Originality				.898
Variety of Resources				
Grade 6				
Global Quality		.723	.678	.593
Cognitive Quality			.352	.503
Originality				.741
Variety of Resources				

Summary

The errors of measurement of the instruments used to measure student outcomes appear to be sufficiently small for the instruments to be useful in the study. The psychometric data for cognitive and affective measures support the conclusion that the measures are of sufficient reliability for purposes of the study. Interjudge reliabilities for the product evaluations also were satisfactory. Data for the Level of Independence Interview, Part II, suggest this measure, while not as reliable as the other measures, was acceptable.

Measures of Antecedent Variables

Antecedent variables are traits and abilities the student possesses before entering the study which may influence the effectiveness of the study treatment. Two antecedent variables were of interest in the Phase II study: verbal ability and student background. A description of the two antecedent measures follows.

Short Test of Educational Ability

The verbal meaning subscale of the Short Test of Educational Ability (STEA) was used to measure verbal ability. The STEA was selected as the verbal ability measure for several reasons: (1) administration time was brief (30 minutes); (2) correlations with longer tests of educational ability, e.g., SRA, were respectable (between .54 and .82 for grades 4-6) and thus there was evidence of concurrent validity; (3) internal consistency was high with a split-half coefficient of .91; and (4) a single version was appropriate for grades 4-6.

The subscale contains 40 multiple choice vocabulary items. In each item, the student is presented with a stimulus word and asked to choose from four alternative words the one which best matches the meaning of the stimulus word. The STEA subscale was administered to all students during the pretesting cycle. The mean, standard deviation, Cronbach's alpha, error of measurement, and sample size for the fourth, fifth and sixth grade sample are presented in Table 25.

TABLE 25
Short Test of Educational Ability
(Verbal Ability)
Psychometric Data

Grade	$\bar{X}$	S.D.	α	E.M.	N*
4	13.32	7.64	.89	2.55	191
5	19.10	8.86	.91	2.65	196
6	25.13	9.14	.92	2.52	192

* N represents the final sample on which data analyses were run (i.e., all target/non-target, treatment/control students in the mid and high SES groups).

Level of Independence Interview--Part I

Part I of the Level of Independence Interview was used to collect student background information. The information collected included: sex, age, grade, and language(s) spoken other than English. The background information questions were placed at the beginning of the Level of Independence Interview so that testers could begin by asking non-threatening questions and could establish a rapport with students before

attempting the more difficult questions in Part II of the interviews related to level of independence (see previous section for description). Part I of the LOI interview was given to all students in the treatment and control classes during pretesting, to target and non-target students during posttesting and to target students only in January. The mid and posttesting uses of the interview were for student warm-up purposes only.

PROCESS VARIABLES

The process variables of interest in the Phase II Study were those which described the amount of independent learning taking place in the classroom and the social climate of the classroom. Three process measures were used. Table 26 lists the instruments, the variables which were

TABLE 26
Phase II Study
Process Variables and Instruments

Variable	Instrument	No. of Items	Admin- istered to	Point of Administration		
				Pre	Mid	Post
Amount of Independent Study	Student Interview		Target students	X	X	X*
Organization and Learning Activities	Classroom Observation		All Classrooms	X	X	X*
Diversity	Social	10	All Students			X
Clarity	Climate	10				
Simplicity	Questionnaire	10				
Pace		9				

* The student interviews and classroom observations were conducted as follows: pre, September-November 1974; mid, between December 1974 and February 1975; post, between February and April 1975.

measured, the number of items in the measure where appropriate, and to whom and when the instrument was administered.

Student Interview

The purpose of the Student Interview was to monitor the social studies instruction and independent learning projects of target students in the treatment and control classes. The interview was developed and field tested by Far West Laboratory staff specifically for this study. It contained questions about social studies in general (What is it? Do you study social studies in class?) and about independent projects in the area of social studies (What are you studying? What resources do you use? Do you discuss your project with your teacher? How many students are working on the same topic?). A copy of the interview procedures is contained in Volume III.

Interviews were conducted with target students in the treatment and control class three times during the year: late fall, winter, and spring.

Prior to data collection, five interviewers were trained through role-playing simulation interviews and through practice interviews with students in grades 5-6. Each interviewer conducted an interview with a project staff member acting the role of student as a check on the interviewers' questioning procedures. All were found to be following the procedures and using appropriate probing techniques.

To assess accuracy of coding, interviewers coded student responses from tape recordings of five interviews conducted by the developer of the interview schedule. Their codings were then compared with the developer's coding. Results of the comparisons are presented in Table 27. With the

exception of the fifth interview, all interviewers reached 80% agreement with the developer on the coding of the students' responses to the interview questions. All interviewers reached at least 85% agreement with the developer for the five interviews combined.

TABLE 27
Coding Reliability on Student Interview
Five Model Interviews

Interviewer	Interviews					Total
	1	2	3	4	5	
1	86*	100	93	100	92	94
2	86	82	86	100	77	86
3	93	100	93	91	92	94
4	93	82	86	91	100	90
5	86	91	100	91	100	94

* Scores are shown as percentage of agreement with a scoring key.

Classroom Observation

The purpose of classroom observation was to obtain information on fidelity of treatment: the degree to which independent learning existed in treatment and control classrooms. Its primary focus was on the organizational procedures and learning activities occurring in the classroom. A copy of the observation instrument is contained in Volume III.

Five variables addressed by the observation procedure reflected characteristics of the independent learning system which was to be installed as the Phase II treatment condition. These were:

1. The number of adults engaged in an instructional task with one or more students. It was assumed that classrooms in which an independent learning system was in use would be more apt to use parent volunteers, other aides, and/or teacher teams.
2. The amount of student influence in determining the nature and direction of learning. This was an overall estimate on a three-point scale ranging from 1 (students carry out tasks assigned by the teacher) to 3 (students pursue tasks which they have identified and planned themselves). It was based on observation of all students in the classroom.
3. The number of activity groups operating in the classroom. All students engaged in the same activity constituted an activity group.
4. The number of students engaged directly by the teacher, that is, the number of students who were intended to receive a particular teacher communication.
5. The activity of the teacher, coded:
 - a. consultation--one to one discussion with a student
 - b. discussion/lecture--any verbal interaction with students which was not consultation
 - c. working alone
 - d. monitoring student activity
 - e. distributing materials or giving directions
 - f. other.

The observation required approximately 20 minutes. Two variables, the number of adults and student influence, were observed only once each observation period and reflected an overall estimate. The number of activity groups, number of students engaged, and the teacher's activity were recorded every two minutes; thus 10 observations were made on these variables during each observation period. Classroom observation data were collected in three cycles: the first, between October 10 and December 20, 1974; the second or mid-year cycle, between January 6 and February 28, 1975; and the third or end of year cycle between March 3 and April 30, 1975.

Five observers were trained in October of 1974 and retrained in January of 1975. The initial training, conducted over two days, included an explanation of the observation variables and coding categories and four practice observation sessions in elementary school classrooms not included in the study. The one-day retraining session reviewed observation variables and coding but did not include practice sessions.

Accuracy of coding was checked at the time of the initial training. The five observers worked in two groups to observe classrooms. The observation trainer observed one classroom with each group to determine the percentage of agreement between the trainer's and the observers' coding. Table 29 presents the results of this reliability check. Data on the student influence variable were not reported by the trainer; therefore, no estimate of agreement was reported for this variable.

TABLE 29

Percent Agreement Between Trainer and
Observer on Four Observation Variables*

Observer	Variable			
	# Adults	# Groups	Students Engaged	Teacher Activity
Group 1				
A	100	70	80	60
B	100	80	90	60
C	100	100	90	60
Group 2				
D	100	100	88	88
E	100	88	100	100

* Agreement data were not collected on the student influence variable.

Accuracy of coding also was checked during data collection by having the trainers work with each observer at least once during each cycle to compare observation codings. All observers reached at least 90% agreement with the trainer over all variables on each check. Because these checks were not reported by variable and because student influence was not reported during the training reliability check, it is difficult to determine the actual agreement over time among observers on each separate observation variable.

Data collected through observations will be used to describe treatment conditions in groups of classrooms. They will not be included in the analysis of student outcome variables.

Social Climate Questionnaire

The Social Climate Questionnaire was designed to obtain students' perceptions of the social and instructional atmosphere in their classes. It was intended to provide information about the interpersonal relationships in the classroom among students, between teacher and student, and between students and learning conditions.

The Questionnaire was composed of items from the Learning Environment Inventory (Anderson, 1970; Walberg and Anderson, 1968). The original instrument contained 15 subscales. It was modified by selecting eight scales measuring variables of interest to the study, by rewording some items so they could be more easily understood by elementary school children, and by stating the items in terms of social studies instruction. This first modification resulted in an 80 item instrument, which was pilot tested with children in grades 4-6. The pilot test yielded internal consistencies from .59 to .80 for the eight subscales. Given that the

pilot was conducted in a small number of relatively homogeneous classes, the coefficients were considered adequate.

The Questionnaire was administered to all students during posttesting. Since the time required for the total posttesting cycle needed to be reduced to meet the time constraints of the schools and since the Social Climate Questionnaire was the only posttest which had not been administered previously and was the longest test, it was modified a second time. Two staff members, knowledgeable in the area of test construction and independent learning, reviewed all items in the instrument and chose those which covered the variables most important to a study of independent learning. This second modification resulted in an instrument containing four subscales. The subscales were: (1) Diversity, the degree to which varying interests and activities were encouraged and provided for in the classroom; (2) Clarity, the degree to which pupils were aware of instructional goals and objectives of the group; (3) Simplicity, the ease with which students could perform instructional tasks; and (4) Pace, the degree to which classroom instruction provided for individual rates of learning.

The Social Climate Questionnaire was read to the students as they followed and marked answers in their test booklets. Table 30 provides the number of items, mean, standard deviation, alphas, and standard error of measurement for the four subscales, based on the target/nontarget student sample. A copy of the instrument is contained in Volume III; additional psychometric data are reported in Volume II.

TABLE 30
Social Climate Questionnaire Subscales
Psychometric Data
Target and Nontarget Students

Scale	Items	Grade	N	$\bar{X}$	S.D.	α	E.M.
Diversity	10	4	191	26.71	4.40	.61	2.75
		5	194	24.13	4.39	.68	2.49
		6	191	25.96	4.26	.65	2.51
Clarity	10	4	191	28.25	3.58	.47	2.61
		5	195	28.30	3.34	.51	2.34
		6	191	28.43	3.5	.61	2.18
Simplicity	10	4	191	21.12	3.85	.58	2.50
		5	194	21.25	3.14	.46	2.31
		6	191	20.96	3.4	.58	2.20
Pace	9	4	191	24.68	3.25	.40	2.51
		5	194	23.84	3.61	.56	2.38
		6	191	24.37	3.45	.54	2.34

Summary

The agreement of interviewers/observers coding with developer (trainer) coding for the student interviews and classroom observations suggests that these process variables may be used as intended in the study. The Social Climate Questionnaire also seems to be of sufficient reliability to be used, although as is often the case with attitudinal and judgmental measures, the reliability appears to be moderate, at best.

CHAPTER FOUR

RESULTS

The two phases of this study of the effects of independent learning upon student achievement and attitudes were designed to determine the extent to which teachers acquired skills related to using such an instructional system (Phase I) and to investigate the effects of implementation of independent learning (Phase II). The results of Phase I and Phase II are reported below. These include teacher training data, data regarding classroom organization during Phase II, and student outcome data for traditional achievement measures, measures associated with independent study, and affective variables.

TEACHER PERFORMANCE

In the spring of 1974, videotapes were made of teachers' performance before (pre) and after (post) they received Minicourse 15 training. Four teacher-student discussion sessions were taped for each teacher during both the pre and post course tapings. Half of these sessions provided information about the teacher's use of Minicourse 15 skills in assessing a student's readiness for independent learning (assessing sessions) and half provided information about skills in planning independent study contracts (planning sessions).

The first two sessions in both the pre and post tapings were assessing sessions. Two students, randomly selected from the teacher's class list, met individually with the teacher. Teachers were asked to assess the amount of help the student would need in planning and conducting an independent study project. The time allowed for each of these sessions was approximately six minutes.

The third and fourth taped sessions were concerned with student contracts. Again, each teacher met individually with two randomly selected students. The teachers were instructed to plan an independent study contract in the area of social studies with each student. Approximately fifteen minutes were allowed for each planning session.

Of the 46 teachers in the Phase I treatment group, 45 completed the Minicourse 15 training and the taping sessions. One teacher who refused to participate in the post taping was dropped from the study. The pre and post videotapes of the 45 teachers were evaluated by three persons trained as critiquers; their training, inter-rater reliability, and the procedures for coding and evaluating the tapes are discussed in detail in Lai and Mills (1974). A summary of the findings follows regarding teachers assessing and contracting skills.

Assessing Sessions

In reviewing the assessing session tapes, critiquers were asked to code the dialogue that occurred between teacher and student as questions were asked and answers given. The questions and answers were categorized into four assessing areas presented in Minicourse 15: assessing student skill in identifying a study topic, outlining things to be done, identifying resources, and setting deadlines. For each assessing area, comparisons were made between the numbers of teachers covering the area during the pre course sessions and the post course sessions. More important than the tests of significance between pre and post sessions, however, is the number of teachers who covered the assessing areas after training and who would therefore be expected to use them when implementing the independent learning system in their classroom. Table 31 shows the percentage of teachers covering each area during the post sessions and the results of the pre/post comparisons.

TABLE 31
Use of Assessing Behaviors in Minicourse 15
by Teachers Receiving Training

Assessing Areas	% of Teachers Using Behavior Post (n=45)	Pre/Post Comparison*
1. Identifying a topic	100	n.s.
2. Outlining things to be done	82	p = .001
3. Identifying resources	93	p = .006
4. Setting deadlings	80	p = .000

* Sign test of statistical significance (Siegel, 1956)

For three of the four areas, the number of teachers covering the area during post sessions was significantly greater than the number doing so at the pre sessions. The pre/post comparison in Area 1, identifying a topic, was not significant because nearly all teachers (93%) covered this area during the pre taping. As stated by Lai and Mills (1974), the percentage of teachers addressing each area at post taping was considered to be more critical for insuring a strong treatment during the implementation phase of the study than the significance of the gains between pre and post training. Retraining was planned, therefore, to emphasize the second and fourth assessing areas, outlining things to be done and setting deadlines.

Planning Sessions

Critiquers were trained to evaluate the planning session tapes according to the seven areas presented in Minicourse 15 as teaching behaviors associated with planning independent learning contracts. These seven

planning areas were: specifying what is to be learned, specifying how learning will be demonstrated, identifying available resources, specifying learning steps, establishing checkpoints, establishing deadlines, and describing an anticipated activity.

Rather than coding simply whether or not a teacher had covered an area, as was done for the assessing session tapes, the dialogue was coded as being at one of three levels in each planning area. In general, level 1 was assigned if the planning area was not covered; level 2, if it was discussed in general terms or if only part of the area was covered; and level 3 when the entire area was discussed in specific terms. It should be noted, however, that although three levels were used, both levels 2 and 3 reflected an acceptable level of performance in most areas. (Refer to Lai and Mills [1974] for a complete description of the evaluation procedures and coding categories.)

Table 32 reports by planning area and coding levels the performance of teachers during the post training sessions. It also shows the results of comparisons between the number of teachers covering the area (coded as either level 2 or 3) at pre and post training sessions.

The teachers showed significant gains in their coverage (levels 2 and 3) of all planning areas. The percentage of teachers, however, in each of the three levels at the time of the post sessions indicated that the level of performance varied among areas. Thus, a high level of performance was attained for the skills of stating a topic specifically (Area 1a), identifying several types of resources (Area 3) and establishing deadlines (Area 6). By contrast, 31% of the teachers were not specific enough in covering how learning was to be demonstrated (Area 2); 40% did not establish checkpoints

TABLE 32

Use of Planning Behaviors in Minicourse 15
by Teachers Receiving Training

Planning Areas	% of Teachers Using Behavior Post (n=45)			Pre/Post Comparison for Levels 2+3*
	Level 1	Level 2	Level 3	
1. Specifying what is to be learned				
a. Specificity of topic	2	4	94	p = .002
b. Topic emphasis	4	64	31	p = .011
2. Specifying how learning will be demonstrated	4	31	64	p = .001
3. Identifying available resources	4	6	89	p = .015
4. Specifying learning steps	24	22	54	p = .000
5. Establishing checkpoints	40	24	36	p = .000
6. Establishing deadlines	16	11	73	p = .000
7. Describing anticipated activity	56	4	40	p = .000

* Sign test of statistical significance (Siegel, 1956)

(Area 5) and 24% did so incompletely; and 24% did not state learning steps (Area 4) with an additional 22% doing so incompletely.

In Area 1b, topic emphasis, coding levels indicated the nature of the learning required by the topic (level 1, noncognitive; level 2, factual; level 3, higher cognitive). While suggesting that teachers emphasize topics

requiring higher order learning, Minicourse 15 states that both factual and higher order objectives are appropriate. Since 64% of the teachers specified factual objectives (level 2) in the post sessions, it was decided to remind them in retraining of higher order learning objectives without necessarily asking that they move away from the factual level.

Describing an anticipated activity, Area 7, was omitted by 56% of the teachers during the post sessions. Some teachers indicated they did not agree that a motivational device was desirable as a reward for completing a contract, and several others simply lacked time to include this last step in the fifteen minutes allotted. Since this area is treated as a managerial option in Minicourse 15, retraining was considered unwarranted.

In summary, as stated in Lai and Mills (1974), Minicourse 15 training of the teachers assigned to the treatment group resulted in substantial change in their performance in both assessing and planning. After training, teachers could assess students' level of independence in planning independent projects and could plan independent learning contracts at a higher skill level than they did before training. There were, however, a number of areas identified by the post training performance which warranted special attention in retraining. It therefore seemed important to emphasize specifying how learning was to be demonstrated, establishing checkpoints, and stating learning steps in the retraining session.

Retraining

Retraining was conducted in Fall, 1974, prior to implementing the independent learning system in treatment classrooms. As explained in the preceding section, post training results led to the decision to emphasize

the following areas in retraining: outlining things to be done and setting deadlines (assessing areas), specifying how learning would be demonstrated, specifying learning steps, and establishing checkpoints (planning areas). While all of the assessment and planning areas were reviewed, these behaviors were emphasized.

Retraining was conducted by the study staff and carried out in two steps: a one-day group session and a one-hour individual session in each teacher's classroom after school.

At the beginning of the one-day group session, teachers were given a general review of Minicourse 15 and were shown the overview film. Assessment procedures were reviewed and the film for Instructional Sequence I, focusing upon assessing student readiness, was shown. Teachers then conducted and audiotaped two fifteen- to twenty-minute lessons on assessing students' levels of independence, with another teacher roleplaying the part of the student. After evaluating their audiotaped lessons, the teachers participated in a general discussion and review of the audiotapes. A similar procedure was followed with planning behaviors: viewing a film from the course, audiotaping and evaluating contracting sessions, and general discussion. Throughout, the assessing and planning areas selected for emphasis were given particular stress.

Following these reviews of the Minicourse 15 skills, procedures for introducing independent learning activities into the classroom were discussed.

After group retraining, each teacher was asked to meet with one of his/her students and audiotape a simulation exercise on developing an independent learning contract. A member of the study staff then met with each teacher individually and evaluated the teacher's use of the Minicourse 15

skills as evidenced in the audiotape. They viewed a course film and discussed the planning and assessing areas, again stressing those areas in which performance most needed improvement. Each teacher was asked to review the course skills independently and to follow the plan for introducing independent learning provided in the Teachers Handbook for Minicourse 15.

As a result of this training-retraining cycle, it was judged that Minicourse 15 trained teachers could be expected to establish an independent learning system. Empirical evidence obtained during the training phase showed that a substantial portion of the teachers achieved a desired level of performance. While no empirical evidence was gathered during retraining, discussions with teachers and a review of simulation tapes indicated that the treatment group teachers were using the skills taught in Minicourse 15.

CLASSROOM ORGANIZATION

The implementation of an independent learning system establishes a particular type of classroom organization characterized by individualization of instruction and student self-direction. One would expect teachers in an independent study system to work with small groups of students, meet with individual students to discuss work in progress, and allow students to make decisions about their learning more often than teachers in a classroom in which independent learning was not in use.

In order to investigate the type of activities and the nature of student-teacher interactions which occurred in classrooms during Phase II of the Independent Learning Study, classroom observation data and student interview data were collected. A summary of the results for both the observation and interview data follows.

Classroom Observation Data

The five items from the Classroom Observation Schedule which provided information on classroom conditions important to a study of independent learning were:

1. The number of adults engaged in an instructional task with one or more of the students in the class. The two categories used in reporting this data were: (a) only one adult is engaged and (b) more than one adult is engaged in an instructional task.
2. The amount of student influence in determining the nature and direction of learning. The three categories of student influence were: (a) low--students carry out tasks assigned by the teacher; (b) mid--students choose from alternatives presented by the teacher; and (c) high--students pursue tasks which they have identified and planned themselves.
3. The number of activity groups operating in the classroom. An activity group was comprised of students who all were engaged in the same activity. Two categories were used: (a) only one group and (b) more than one activity group.
4. The number of students engaged directly by the teacher, that is, the number of students who were intended to receive a particular teacher communication. The four categories used in reporting the number of students engaged were: (a) no students; (b) one or two students; (c) three to nine students; and (d) ten or more students.
5. Teacher activity. The six categories used to record the activity of the teacher were:
 - (a) Other--any activity which could not be placed in the following categories;
 - (b) Consultation--one-to-one discussion with a student;
 - (c) Discussion/lecture--any verbal interaction with students which was not one-to-one consulting;
 - (d) Working alone--the teacher was working on tasks which did not directly involve students (marking papers, preparing materials, etc.)
 - (e) Monitoring--the teacher was overseeing student activity, listening to student presentations, available but not engaged with any student;
 - (f) Materials/direction--the teacher was distributing materials or giving directions to students.

As explained in Chapter Three, classroom observation data were collected in three cycles: the first, between November 1 and December 20, 1974; the second, between January 6 and February 28, 1975; and the third, between March 3 and April 30, 1975. With the exceptions of two classrooms which were not observed during the first cycle, at least one observation was made of each classroom during the fall, winter, and spring cycles. Ten two-minute observations were made each time a class was observed and, with a few exceptions, multiple observations were made on classrooms during each data collection cycle.

Frequency counts were made for a classroom on the number of times a reporting category was used to describe the classroom. Since the number of observations varied across classrooms, frequencies were converted to proportions representing the ratio between the number of times a reporting category was scored for a classroom and the total number of times the general item was marked in observing that classroom (e.g., the number of times "only one" was scored and the number of times the number of activity groups was marked). Proportions were obtained on the reporting categories for each observation cycle separately and over all three observation cycles combined.

Two of the observation items, those for number of adults engaged in an instructional task and for number of activity groups, were reported in dichotomous categories--only one or more than one. This was done because in these two cases, the comparison of primary interest was the proportion of time that more than one group or adult was observed. Presence of more than one adult would be expected to affect the extent of opportunities for independent learning, while classrooms at different implementation levels would be expected to differ in proportion of time students worked in more

than one activity group. Thus, number of adults in the classroom and comparison of the proportions by level of implementation (the regrouping of Phase II classrooms based on the extent to which independent learning was in use; refer to Chapter Two for discussion of sample) provides information about the way in which the "quasi-treatment" groups differed.

As a rough guide to the comparison of the proportions for these two dichotomous items, one way analyses of variance were performed separately for the data from each observation cycle and for all three cycles combined. Arcsin transformations of the proportions were made for use in the analyses of variance in an attempt to stabilize the within group variances. It is recognized that the multiple tests are not independent, and that the probability of one or more type I errors over all tests is unknown. However, these tests were viewed only as rough guides to identification of differences. The primary emphasis in this section is on the simple descriptive results.

The observation items for amount of student influence, number of students engaged by the teacher, and teacher activity included three, four, and six scoring categories, respectively. As with the dichotomous items, the focus was on a simple descriptive comparison of the proportion of observations falling in each category. Discriminant analyses of the arcsin transformation of the proportions in various categories were run as rough guides to the significance of the differences in the distributions of proportions in various categories for the three levels of implementation groups. Since the set of categories on a single item were ipsative, i.e., the proportions sum to one, the number of variables entered into the discriminant analysis for a given item was actually one less than the number of categories on that item. The classroom scores on a variable were the arcsin transformation of the proportion of times that a given category was used for that classroom.

Findings

A summary of the results of the twenty significance tests that were performed is provided in Table 33. A complete set of analysis of variance tables and more information on the discriminant analysis results can be found in Appendix E of this report.

TABLE 33
Classroom Observation
Level of Significance Test of
ArcSin Transformations of Proportions

Variable	Observation			Overall
	Fall	Winter	Spring	
More than one adult in classroom ^a	.70	.73	.50	.65
Number of activity groups ^a	.50	.01	.03	.01
Student influence ^b	.26	.58	.64	.17
Number of students engaged by teacher ^b	.02	.01	.57	.01
Teacher activity ^b	.01	.01	.09	.01

^a Probabilities based on F-ratios for one-way analyses of variance.

^b Probabilities based on chi-square tests from discriminant analyses

As can be seen in Table 33, none of the significance tests even approaches significance for the proportion of time with more than one adult in the classroom. The comparability of the level of implementation groups on this item

is quite striking. The overall mean proportion for involvement of more than one adult was .29 for Level of Implementation 1 (non-use of independent learning) and .31 for the classrooms in which over 50% of the students were engaged in independent learning activities (Level of Implementation 3). It appears, therefore, that in those classrooms which implemented an independent learning system, no more use of adults in addition to the teacher to assist students was involved than in the non-independent learning classrooms.

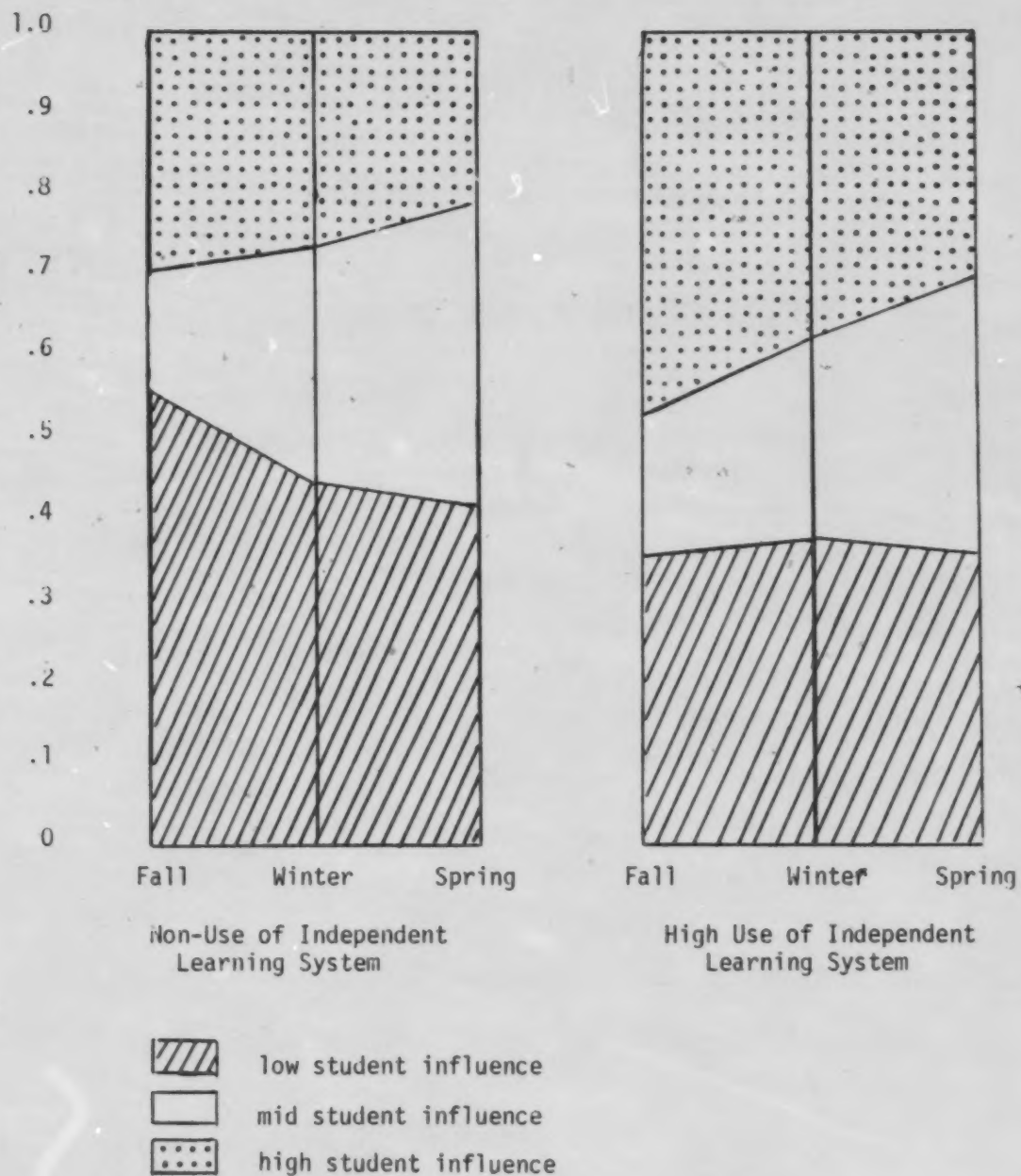
Except for the fall observation, all the comparisons of the proportions of time devoted to more than one activity group were significant. The proportion of time that more than one activity group was observed was consistently higher for the high than for the low implementation group. For the high implementation group, the proportions for more than one activity group were .92, .96, and .95 in the fall, winter, and spring, respectively. The corresponding proportions for the low implementation group were .87, .83, and .83. While the direction of the difference is consistent with what would be expected, the scores for the non-use group are somewhat higher than might have been expected. Apparently the teachers in these classrooms grouped their students for instruction even though they did not involve them in individually designed independent learning activities.

Figure 3 illustrates the distributions of proportions of observations in which student influence was rated as low, mid, or high at the fall, winter, and spring observation periods. The findings are given for Level of Implementation 1 (non use) and 3 (high use).

Generally, the high-use classes showed more student influence during the fall and winter observations than the non-use classes. While these differences were not statistically significant, they suggest that the

FIGURE 3

Classroom Observation
Proportion of Student Influences
by Category

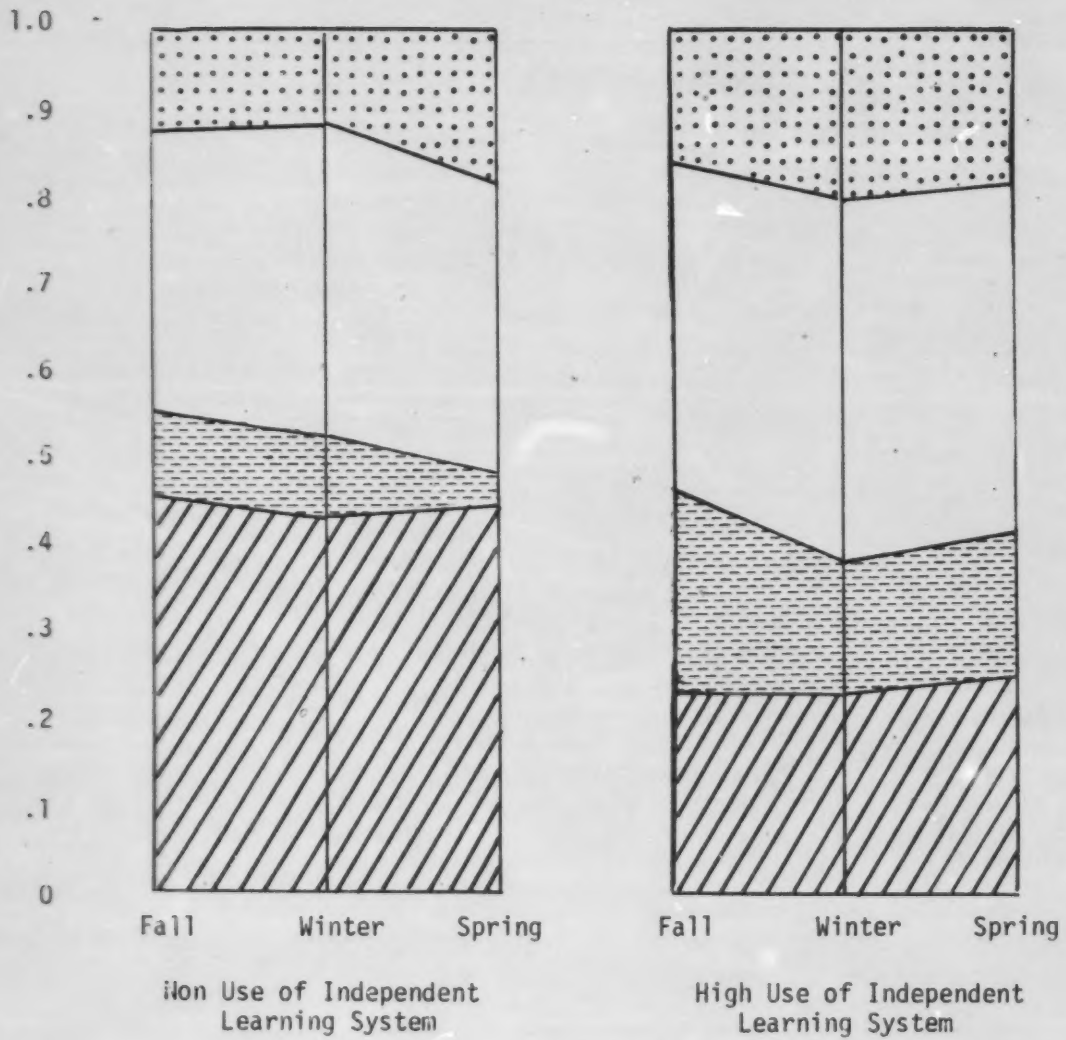


teachers in the high-use classes were attempting to involve students in selecting and outlining their learning activities more than the other teachers. Combining mid and high student influence proportions, high use classes showed proportions of .65 and .62 in the fall and spring as compared with .45 and .55 respectively in non-use classes. During the spring observations, the high-use and non-use groups of classes look more alike with combined mid and high student influence proportions of .65 and .59 respectively. This latter finding was somewhat surprising in that it could be anticipated that students in high-use classes would increase in the amount of influence they were able to have on the nature and direction of their learning as the year progressed. The general decrease in amount of high student influence observations in high-use classrooms was not expected. This does not, however, suggest that the finding is necessarily negative. Rather, it may indicate that after initiating independent learning, teachers found their students were not, as yet, able to plan well-designed learning activities. In order to provide an effective teaching/learning situation, these teachers, therefore, would need to have given students more assistance in their planning as the year progressed, thereby lowering the amount of student influence that was observed.

The distributions of mean proportions of time that various numbers of students were engaged by their teacher is shown in Figure 4 by observation cycle for the non-use and high-use implementation groups. The major difference between the groups is that the high-use group has a smaller proportion of observations during which ten or more students were engaged by the teacher and associated larger proportions during which fewer students were engaged. For both implementation groups, there is a striking stability in the proportions for different observation periods. The direction of the differences

FIGURE 4.

Classroom Observation
Proportion of Time that Various
Numbers of Students are Engaged
by Teacher



-  0 students
-  1 or 2 students
-  3 to 9 students
-  more than 10 students

in the number of students engaged by the teacher is consistent with expectations. By its nature, increased emphasis on independent study would be expected to require a teacher to work with smaller groups of students, thereby reducing the proportion of time in which ten or more students would be engaged by the teacher.

The results of the discriminant analysis for teacher activity showed significant differences for all but the spring observation. The mean proportions for each category of teacher activity are reported in Table 34 by observation period for the non-use and high-use implementation groups. While the differences are generally small, the pattern is reasonably consistent with what would be expected. In particular, overall and for the winter and spring observations, the mean proportion in the discussion/lecture category is somewhat less for the high-use than the non-use implementation group.

TABLE 34

Mean Proportions of Teacher Activities
in Various Categories by Observation Period
for Non Use and High Use Implementation Groups

Category of Teacher Activity	Non Use Implementation				High Use Implementation			
	Fall	Winter	Spring	Overall	Fall	Winter	Spring	Overall
Consultation (1-1)	.24	.35	.30	.30	.28	.35	.33	.33
Discussion/ Lecture	.32	.32	.31	.32	.31	.23	.26	.26
Working Alone	.01	.02	.05	.03	.08	.10	.09	.10
Monitoring Students	.27	.17	.20	.20	.11	.14	.14	.13
Materials/ Directions	.10	.10	.10	.10	.17	.13	.14	.14
Other	.05	.05	.04	.04	.05	.05	.05	.05

Summary

The differences in the results for the high-use and non-use implementation groups, while generally not large, were consistently in the direction that would be expected for all five classroom observation items. Teachers in the high-use implementation group were less apt to be working with a large group of students, lecturing to the class, or leading a discussion than were their counterparts in the non-use group. Multiple activity groups, while common in both groups, were more likely to be found in classrooms in which 50% or more of the students were engaged in independent learning activities than in classrooms in which no students were engaged in such activities. Level of student involvement was apt to be greater in high-use than in non-use classrooms. In general, therefore, it would seem that the classification of classrooms by level of implementation of the independent learning system resulted in groups of classrooms that differed in ways that are consistent with the intent of Minicourse 15 goals.

Student Interview Data

Interviews were conducted with target students immediately following the classroom observations in both treatment and control classes. A description of the interview schedule and procedures is provided in Chapter Three.

Five important aspects of planning and carrying out an independent learning project were addressed by the interview questions. They were:

1. Statement of a learning objective. The student was/was not able to describe the purpose of his/her social studies project and what he/she expected to learn.
2. Consultation with teacher. The student had/had not discussed his/her learning objective with the teacher on a one-to-one basis.

3. Amount of student influence. Three categories were used to record responses to questions about student influence: (a) the student had no choice in selecting a learning objective or topic; (b) the student chose from alternatives presented by the teacher; and (c) the student suggested the topic himself/herself.
4. Statement of deadline. The student had/had not set dates when his/her work was to be completed.
5. Demonstrating learning. The student was working on an end product and was/was not able to describe how (s)he would demonstrate what had been learned.

Although target students were interviewed during each of the three observation cycles, not all students in the final sample were interviewed during the first cycle. As was discussed in Chapter Two, target students who moved or changed classes before December 20, 1974, were replaced by other students in the class--most of whom had been interviewed in the first cycle. Therefore, rather than summarize the interview data by cycle, a decision was made to utilize the last interview conducted with a student for data analysis.

The main comparison of interest for these data is between students who were in classes at different levels of implementation. For classrooms at each of the three levels of implementation, frequency counts were made of the number of target students who were coded "yes" in questions, 1, 2, 4, and 5 (above) and of the number in each reporting category of question 3. For the four dichotomous items, comparisons were made in terms of proportions of students at each implementation level who gave responses in the direction consistent with Minicourse 15 objectives (a "yes" response). For the student influence item, the students at different implementation levels were compared in terms of the proportion in each response category. Proportions on each item by level of implementation were obtained separately

by grade level. These results are available in Appendix F. The results reported below are based on the pooled data from grades 4, 5, and 6.

Findings

The interview question related to learning objectives showed no significant differences based upon levels of implementation. Almost all students at all three levels of implementation were able to define the learning objective on which they were working. All twenty-two target students at the middle implementation level identified their learning objective. At the low implementation level, 96.4% of the 139 students identified their learning objective, and 97.5% of the 120 students in the high implementation group identified their learning objective.

Sharp differences among implementation levels were found on the question that asked students if they discussed the objective with their teacher on a one-to-one basis. The percentages of students at each implementation level responding "yes" to this question are reported in Table 35. As can be seen, a small percentage of students in the low implementation group indicated that they had had a discussion of the objective with their teachers.

TABLE 35

Students Reporting a
Discussion of Objectives with Their
Teacher on a One-to-One Basis

<u>Level of Implementation</u>					
Low		Middle		High	
<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>
139	8.6	22	63.6	119	45.4

In contrast, nearly half of the high implementation students and over half of the mid implementation students reported such a one-to-one discussion. The high level of one-to-one discussions in the middle level of implementation classes is interesting to note. These were the classes in which only the target students completed independent learning contracts while, in contrast, more than 50% of the students in the high implementation classes worked on contracts. It appears from the interview data that teachers engaged in fewer one-to-one discussions as more students became involved in contracts, perhaps because the teachers had less time to spend with each student.

Substantial differences among implementation levels also were observed in the degree of influence that students reported having upon the selection of the study topic. These results are reported in Table 36. The majority of low implementation target students were found to be in the lowest influence category (i.e., project assigned by teacher) whereas the majority of target students at the middle and high levels of implementation were found to be in the highest influence categories (i.e., project defined by student). These

TABLE 36
Distribution of Student Influence
by Level of Implementation

Degree of Influence	Level of Implementation		
	Low (N=140)	Middle (N=22)	High (N=120)
Low (Project assigned)	77.8	4.5	27.5
Middle (Chooses project)	15.0	18.2	7.5
High (Defines project)	7.1	77.2	65.0

differences in student influence are consistent with the goals of Minicourse 15. The lack of differences favoring the high over the middle implementation group is not surprising. Students who carry out independent projects, whether part of a larger number of students engaged in such tasks (high implementation) or part of only six students engaged in such tasks (middle implementation) may be expected to have similar degrees of influence upon what they are to learn.

A smaller percentage of low implementation group students reported a project deadline (62.8%) than did the students in either of the other two groups. The corresponding percentages were 72.7% and 74.2% for the middle and high implementation groups, respectively.

The low and high implementation groups were indistinguishable in terms of being able to define the end product for their projects. Of the target students in the low implementation, 89.5% were able to define their end product, compared to 89.9% in the high implementation group. For both groups, the percentage was lower than that for the middle implementation group in which 100% of the students defined their end products. This finding also appears to reflect the extra teacher attention given the target students in the middle implementation classes.

Summary

Differences in student interview responses were consistent with the types of classroom organization expected for high, middle, and low implementation classes. Generally, fewer students in low than in middle and high implementation classes were able to describe what they were to learn, how they would demonstrate what they learned, and when the work was to be completed. Low implementation students also had less one-to-one interaction

with the teacher and less influence in selecting what would be learned than did middle and high implementation students.

Only slight differences were found in the reports by middle and high implementation students about the ways in which their learning was organized. Interestingly, the proportion of target students who reported working in ways consistent with Minicourse 15 goals was slightly higher at the middle implementation level than at the high implementation level.

STUDENT OUTCOMES

Whenever a new approach to instruction is implemented as a result of teacher training, it is important to study the effects of this new "system" upon student learning outcomes. Such was the purpose of the present study.

As was discussed in the preceding section, those classes in which Minicourse 15 skills and categories were in moderate to high use differed from the non-use classes in the types of activities in which teachers and students engaged. It is appropriate, therefore, to consider whether or not these differences in teaching/learning activities influenced student outcomes. Three types of outcomes were considered to be important: (1) learning outcomes measured by traditional types of achievement tests, (2) learning outcomes associated with the particular purposes of the independent learning system, and (3) affective outcomes.

The statistical analyses that were conducted relative to student outcomes are discussed in detail in Chapter Two. They are closely related to commonality analyses in which an attempt is made to divide the proportion of predicted variance on an outcome measure into portions that are unique to each variable and portions that are attributed jointly to each possible combination of variables.

Inasmuch as the potential number of predictor variables was quite large for the study reported here and they naturally fell into a few broad categories, clusters of predictor variables were included in the analyses. Table 37 lists the predictor variables included in each cluster for each student outcome variable.

Cluster 1 consists of student input measures. Where pretest and posttest scores on the same variable were available, the pretest was included in Cluster 1. Verbal Ability also was included in Cluster 1 for all dependent variables and the Level of Independence pretest was included for the cognitive outcome measures. For the Level of Independence posttest analyses, the Work Study Skills pretest was included since it was thought that these skills might be related to how well a student would function independently.

Cluster 2 consists of the "quasi-treatment" variables, that is, level of implementation and a dummy variable coded 1 for target and 0 for nontarget students. If there is a substantial difference in the dependent variable due to level of implementation and/or a difference between target and nontarget students that is unrelated to student input variables then the multiple correlations for Clusters 1 and 2 combined should show a substantial increment over the multiple correlation for Cluster 1 alone. For the product evaluation, grade level dummy variables were included in Cluster 2 rather than the target/nontarget dummy since target students from grades 4, 5, and 6 were combined for this analysis.

The third cluster of variables consists of interaction terms, i.e., the cross products of level of implementation and Verbal Ability or Level of Independence Pretest. A substantial increment in the squared multiple correlation would be indicative of an interaction between student input

TABLE 37

Clusters of Predictor Variables
Student Outcome Analyses

Outcome Variable	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Work Study Skills	Work Study Skills (Pre) Verbal Ability Level of Independence (Pre)	Level of Implementation Target/nontarget dummy	Level of Implementation X Level of Independence (Pre) Level of Implementation X Verbal Ability	Classroom Climate - Diversity - Clarity - Difficulty - Pace Level of Independence (Post)
Social Studies Achievement	Social Studies Achievement (Pre) Verbal Ability Level of Independence (Pre)	Level of Implementation Target/nontarget dummy	Level of Implementation X Level of Independence (Pre) Level of Implementation X Verbal Ability	Classroom Climate - Diversity - Clarity - Difficulty - Pace Level of Independence (Post)
Level of Independence	Level of Independence (Pre) Work Study Skills (Pre) Verbal Ability	Level of Implementation Target/nontarget dummy	Level of Implementation X Level of Independence (Pre) Level of Implementation X Verbal Ability	Classroom Climate - Diversity - Clarity - Difficulty - Pace Work Study Skills (Post)
Product Evaluation	Verbal Ability Level of Independence (Pre)	Level of Implementation Grade Level Dummy 1 Grade Level Dummy 2	Level of Implementation X Level of Independence (Pre) Level of Implementation X Verbal Ability	Classroom Climate - Diversity - Clarity - Difficulty - Pace Work Study Skills (Post) Social Studies Achievement (Post)
Self-Concept	Self Concept (Pre) Verbal Ability	Level of Implementation Target/nontarget dummy	_____	Classroom Climate - Diversity - Clarity - Difficulty - Pace
Attitude Toward Teacher	Attitude Toward Teacher (Pre) Verbal Ability	Level of Implementation Target/nontarget dummy	_____	Classroom Climate - Diversity - Clarity - Difficulty - Pace Self-Concept (Pre)
Attitude Toward Social Studies	Attitude Toward Social Studies (Pre) Verbal Ability	Level of Implementation Target/nontarget dummy	_____	Classroom Climate - Diversity - Clarity - Difficulty - Pace Self-Concept (Pre)
Attitude Toward Learning	Attitude Toward Learning (Pre) Verbal Ability	Level of Implementation Target/nontarget dummy	_____	Classroom Climate - Diversity - Clarity - Difficulty - Pace Self-Concept (Pre)
Attitude Toward School	Attitude Toward School (Pre) Verbal Ability	Level of Implementation Target/nontarget dummy	_____	Classroom Climate - Diversity - Clarity - Difficulty - Pace Self-Concept (Pre)

based on cognitive and planning skills and level of implementation. It should be noted that this cluster was not included in the analyses for the affective outcomes.

The fourth cluster contains measures obtained from students at the time of the posttest which are thought to be indicative of certain classroom process variables. Since they were obtained at the end of the school year, they may be viewed as hybrid measures, i.e., indirect measures of process. Thus, interpretation of predictive increments due to Cluster 4 can be taken as only suggestive of process variables that may be important. This is so because the direction of the effects, if any, between these variables and a given dependent variable is uncertain.

Each outcome measure was regressed, first on the variables in Cluster 1, then on those in Clusters 1 and 2, then on those in Clusters 1, 2, and 3, and finally on the variables in all four clusters combined. The increment in squared multiple correlations due to the addition of a cluster of predictor variables was then examined to identify sets of variables with potentially important influence on a given outcome measure. Standardized partial regression weights* were then examined to see the direction of the possible effect of specific variables. The effects of the order in which the clusters were entered into the analysis upon the amount of influence that a particular cluster could demonstrate must be considered in interpreting the data that are reported. The decision to begin with the student input cluster and proceed in the designated order was arbitrary though based on much previous research which suggests student input variables are the strongest predictors of student outcomes. The student is used as the

* The regression weights of the individual predictor variables are reported in Appendix G.

unit of analysis. While the classroom would have been a more conservative unit to employ, the student was selected based on the individualized instruction emphasis of the study. In high level implementation classes, in particular, students could be expected to carry out individual learning activities that differed from those completed by other students. Thus, it could be argued that the effects would be individual rather than group effects. Nonetheless, whenever significant effects are reported using the student as the unit of analysis, consideration also is given to whether the effect would have been identified if the classroom had been used as the unit.

Traditional Achievement Measures

There has been discouragingly little research that has shown consistent effects of short-term teacher training on traditional measures of student achievement. Even without such a research base, one might expect Mini-course 15 training of teachers to have relatively small effects on student performance as measured by traditional achievement tests inasmuch as the resulting independent learning system does not emphasize achievement, per se. Nonetheless, it was thought to be important to investigate the possibility that the treatment affected performance on traditional achievement measures, if for no other reason than to provide assurance that increased emphasis on independent learning did not have an adverse impact on student achievement.

Traditional achievement outcomes were measured by two tests: Work Study Skills and Social Studies Achievement.

Work Study Skills Posttest

The pretest and posttest means and standard deviations on Work Studies Skills are reported in Table 38 by grade level and level of independence.

TABLE 38

Work Study Skills
Pretest and Posttest Means and Standard Deviations
by Grade and Level of Implementation

Level of Implementation	Grade 4					
	Pretest			Posttest		
	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Low	11.24	4.43	89	15.19	5.33	89
Middle	7.18	4.66	11	15.67	4.98	12
High	9.74	3.64	37	12.33	4.54	88
TOTAL GROUP	10.30	4.21	187	13.89	5.14	189
	Grade 5					
Low	13.38	5.13	121	15.36	5.63	123
Middle	14.64	5.35	22	16.73	5.17	22
High	15.42	5.08	47	18.31	6.00	48
TOTAL GROUP	14.03	5.19	190	16.25	5.78	193
	Grade 6					
Low	16.94	5.75	81	19.61	5.45	81
Middle	15.00	6.42	20	18.50	6.02	20
High	16.41	6.34	88	19.13	5.85	85
TOTAL GROUP	16.49	6.09	189	19.01	5.67	186

As would be expected, there is a substantial increase in means from pretest to posttest at all three grade levels and at each level of implementation. These results are neither surprising nor of great interest by themselves, but they do provide a context within which to interpret the results of the

primary analyses aimed at investigating differential effects of level of implementation.

Table 39 reports the results of the regression analyses for the Work Study Skills Posttest using the clusters of predictor variables discussed earlier. The squared multiple correlations and increments in squared multiple correlations for each cluster of variables are reported separately by grade. The squared multiple correlation for a given cluster includes the variables in that cluster as well as all the variables in the preceding clusters. Hence, the squared multiples necessarily are nondecreasing as one moves from Cluster 1 to 2 to 3 to 4. The increments are simply the differences between the squared multiple correlation associated with a given cluster and the squared multiple correlation associated with the preceding cluster.

TABLE 39
Work Study Skills Posttest
Squared Multiple Correlations and Increments in
Squared Multiples by Clusters of Predictor Variables

Cluster ^a	Number of Variables in Cluster	Grade 4 (N=181)		Grade 5 (N=186)		Grade 6 (N=184)	
		SMC ^b	Inc ^c	SMC	Inc	SMC	Inc
1	3	.460	.460	.636	.636	.699	.699
2	2	.486	.026	.645	.009	.701	.002
3	2	.486	.000	.648	.003	.703	.002
4	5	.545	.059	.664	.016	.726	.023

^a See Table 37 for list of variables in each cluster.

^b Squared multiple correlation.

^c Increment in squared multiple.

The squared multiple correlation for Cluster 1 (student input) is substantial at all three grade levels and systematically increases in magnitude as one moves from grade 4 to grade 5 to grade 6. This is consistent with expectations based on previous research which has shown substantial correlations between pre and post achievement tests with a tendency for the magnitude of the correlation to increase with grade level.

The increments in the squared multiple correlation due to the addition of the two "quasi-treatment" variables in Cluster 2 are small at all three grade levels. However, the largest increment of .026, which was obtained at grade 4, represents a significant increase ($F=4.43$ with 2 and 175 degrees of freedom). Even this "significant" increment must be interpreted with caution since it is based on the assumption that students rather than classrooms are the experimental unit. A more conservative test would be obtained by using the number of fourth grade classrooms (18) rather than the number of fourth grade students (181) as the number of units for the F test. If this is done, the F test for the increment in the squared multiple due to the addition of Cluster 2 is not significant ($F=.30$). Thus, it must be concluded that there is little evidence that level of implementation or being a target student had an effect on posttest performance on work study skills. This was particularly true at grades 5 and 6. At grade 4, some effect was observed. While this effect was not large, it is interesting to note that it occurred at grade 4 and not in the later grades and that level of implementation was the variable which contributed the greatest increase in the SMC for the cluster; (.025) as contrasted with (.001) for the target/nontarget dummy variable.

The interaction of Level of Implementation with Verbal Ability and with Level of Independence Pretest resulted in little increase in the

squared multiple correlations. As can be seen in Table 39, the largest increment due to the addition of Cluster 3 is .003, obtained in grade 5.

The increments obtained by the addition of Cluster 4 are somewhat larger (between about .02 and .06). Even these increments, however, are of questionable significance. Again, the grade 4 increment is significant if students are treated as the experimental unit ($p \leq .05$, $F = 4.36$, 5 and 168 degrees of freedom). It appears that classroom climate and processes may have had some effect upon these students' performance. Considering the contributions of the individual variables within the Cluster (see Appendix G), students' views of the pace and clarity of what was presented in the classroom appear to have had somewhat more influence than the other variables in that cluster.

The lack of evidence of effects for variables other than those in Cluster 1 that is suggested by the results in Table 39 can also be seen by inspecting the regression weights of the individual predictor variables (see Appendix G); Only the regression weights for Work Study Skills Pretest and for Verbal Ability were consistently positive and significantly different than zero at all grades. For variables in Clusters 2, 3, and 4, regression weights were generally small compared to their standard errors and were not consistent in sign from one grade to another.

Based on the above results, the conclusion is that there is no differential effect of level of implementation on performance on Work Study Skills that is not completely confounded with initial differences at the time of the pretest, particularly at grades 5 and 6. In grade 4, the treatment variables (Cluster 2) and classroom process variables (Cluster 4) show a significant, but small, effect on Work Study Skills performance when students are used as the unit of analysis.

This finding is consistent with the bulk of research on the effects of innovative education programs when a traditional achievement measure is used as the criterion. The fact that some small effects were observed at grade 4 but not at grades 5 and 6, combined with the lower squared multiple correlation for the student input variables at grade 4 than 5 and 6, may have some implications for future research and future innovative program development as well as for teaching. These implications will be discussed in Chapter Five.

Social Studies Achievement

The pretest and posttest means and standard deviations on the Social Studies Achievement Test are reported in Table 40. As expected, the posttest means are higher than the pretest means at each grade level. The magnitude of the difference in means, however, is relatively small.

The squared multiple correlations and increments in squared multiples associated with clusters of variables are reported in Table 41. The pattern of results is similar to that observed for Work Study Skills.

At all three grade levels, the squared multiple correlations for Cluster 1 are substantial (ranging from a low of .428 at grade 4 to a high of .588 at grade 5). However, for social studies achievement there is not the consistent tendency for the magnitude of the squared multiple correlations to increase with grade level as was observed for Work Study Skills, nor are the Cluster 1 multiples as high as they were for Work Study Skills. It is interesting to note, however, that the grade 4 SMC again is the lowest.

The largest increment associated with Cluster 2 is only .022 for grade 4 which, while significant using students as the unit of analysis, does not represent a substantial increase in predictable variance. The importance

TABLE 40

Social Studies Achievement
Pretest and Posttest Means and Standard Deviations
by Grade and Level of Implementation

Level of Implementation	Grade 4					
	Pretest			Posttest		
	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Low	7.91	3.33	88	10.00	3.38	88
Middle	7.17	3.71	12	10.67	3.09	12
High	7.58	3.55	89	8.59	3.21	90
TOTAL GROUP	7.71	3.45	189	9.37	3.56	190
	Grade 5					
Low	9.54	3.55	122	10.45	3.59	122
Middle	10.04	3.36	22	10.86	2.98	22
High	10.81	3.27	48	11.98	3.05	48
TOTAL GROUP	9.92	3.49	192	10.88	3.44	192
	Grade 6					
Low	11.43	2.98	81	12.44	2.88	81
Middle	10.40	3.28	20	11.20	4.06	20
High	11.35	3.37	88	12.35	2.93	88
TOTAL GROUP	11.29	3.20	189	12.27	3.05	189

TABLE 41

Social Studies Achievement Posttest
Squared Multiple Correlations and Increments in
Squared Multiples by Clusters of Predictor Variables

Cluster ^a	Number of Variables in Cluster	Grade 4 (N=183)		Grade 5 (N=187)		Grade 6 (N=186)	
		SMC ^b	Inc. ^c	SMC	Inc	SMC	Inc
1	3	.428	.428	.568	.568	.499	.499
2	2	.450	.022	.575	.007	.506	.007
3	2	.451	.001	.579	.004	.507	.001
4	5	.481	.030	.588	.009	.534	.027

^a See Table 36 for a list of the variables in each cluster.

^b Squared multiple correlation.

^c Increment in squared multiple correlation.

of the Cluster 2 increment at grade 4 for this particular variable may be questioned by the absence of any similar results at grade 5 or at grade 6 where, in both cases, the Cluster 2 increment was only .007. Nonetheless, since a significant Cluster 2 contribution for grade 4 students, but not grade 5 and 6 students, is consistent with the Work Study Skills outcomes, the finding may have some importance when viewed from the perspective of cumulative effects for a given grade level. Again, level of implementation contributed the major increase in the squared multiple correlation for Cluster 2 at grade 4, .02 as compared with .002 for the target/nontarget dummy variable.

There is no suggestion of a significant increment due to the interaction of level of implementation with student input variables. At all three grade levels, the increment associated with Cluster 3 is less than .005.

There is a hint of a contribution to predictive power by the Cluster 4 variables at grades 4 and 6, but at neither grade does the Cluster 4 increment reach significance at the .05 level, even when using students as the unit of analysis. This differs from the results for Work Study Skills where Cluster 4 showed a significant effect at grade 4.

Summary

At the beginning of this section, it was suggested that a "no difference" result was more or less to be expected for traditional achievement measures. Thus, the results for Work Studies Skills and for Social Studies Achievement are not particularly surprising. While not demonstrating that emphasizing independent learning strategies has a positive impact, these results do indicate that, as implemented in this study, such an emphasis is not detrimental in terms of the more traditional measures of student achievement. Further, the results for grade 4 as contrasted with those for grades 5 and 6 suggest that the type of learning system in which students work may have more effect upon learning at the earlier grade level than at the later ones.

Independent Study Measures

The independent learning system based on Minicourse 15 teaching strategies was designed to increase students' skill in working independently, in defining and selecting their own learning tasks, and in using a variety of resources when completing a learning project. Inasmuch as the middle and high implementation classes utilized this learning system with at least the target students, some differences in these areas might be expected to result when the performance of students in the middle and high implementation classes is compared with that of students in the low implementation classes.

Two measures of student outcomes were directly related to the independent learning treatment. The Level of Independence Interview, Part II, measured the degree to which a student could work independently, particularly his or her skill in planning an independent project. The Product Evaluation measured the end result of students having engaged in an independent learning experience--in other words, evaluated products developed by the students. A discussion follows of the findings for each of these measures.

Level of Independence

As noted above, the Level of Independence Posttest measured the extent to which students were able to work independently. For those students who were in classes at the high and middle levels of implementation, level of independence thus provided an indication of the skills they developed as a result of participating in independent learning activities throughout the year. In particular, the interview provided information about a student's skill in planning an independent contract, project, etc.

Table 37 lists the predictor variables that were included in the clusters for this analysis. The squared multiple correlations and increments for each cluster for the Level of Independence (LOI) Posttest are reported in Table 42.

The predictive power of Cluster 1 is considerably less for the LOI than for the traditional achievement measures. In interpreting this lower SMC, it must be noted that the lower values are consistent with what might be expected based on the modest internal consistency coefficients (generally about .5) that were obtained for the LOI measure (see Volume II for psychometric data). At the same time, the low SMCs also are consistent with what

TABLE 42

Level of Independence Posttest
Squared Multiple Correlations and Increments in Squared Multiples
by Clusters of Predictor Variables

Cluster ^a	Number of Variables in Cluster	Grade 4 (N=181)		Grade 5 (N=186)		Grade 6 (N=184)	
		SMC ^b	Inc. ^c	SMC	Inc.	SMC	Inc.
1	3	.135	.135	.117	.117	.294	.294
2	2	.146	.011	.131	.014	.309	.015
3	2	.179	.033	.136	.005	.312	.003
4	5	.197	.018	.158	.022	.372	.060

^a See Table 37 for list of variables in each cluster.

^b Squared multiple correlation.

^c Increment in squared multiple correlation.

might be expected from a process standpoint. Level of Independence incorporates several skills that may not necessarily relate to students' verbal ability or to their skills as reported by paper-and-pencil tests. It is precisely for such reasons that independent learning systems are introduced into school programs to provide students with opportunities to develop more than just verbal skills.

The SMC for Cluster 1 is noticeably higher for grade 6 (.294) than for either of the other grades (.135 and .117). This is consistent with previous findings in which student ability measures have had a somewhat higher predictive power at grade 6 than at grade 4 regardless of the outcome measure that was being investigated.

When Cluster 2 is added, the increments in the squared multiple correlations are small at all three grade levels (.011, .014, .015). This is

somewhat surprising in view of the fact that this was the quasi-treatment cluster. Apparently, level of implementation and target/non-target were not highly related to the students' level of independence at the end of the school year.

The increments associated with Cluster 3 are .033, .005, .003 for grades 4, 5, and 6 respectively. The grade 4 increment is statistically significant if students are used as the experimental unit ($F = 3.48$ with 2 and 175 degrees of freedom). Level of implementation combined with LOI pre or verbal ability has a significant, but small, predictive value for fourth grade students' end-of-year levels of independence.

The addition of Cluster 4 provides no significant increments in the SMC at any grade level, although the grade 6 increment was .06. Apparently, classroom climate variables are not significant predictors of students' level of independence outcomes.

Referring back to the possibility of an interesting interaction between level of implementation, one of the premeasures, and the post Level of Independence (Cluster 2), this was investigated further by obtaining the regression of Level of Independence Posttest on Level of Independence Pretest and the regression of Level of Independence Posttest on Verbal Ability within each level of implementation at each grade level. The sets of regression lines were then tested for parallelism. The tests of parallelism of Level of Independence Posttest on Verbal Ability within the three levels of implementation showed no significant differences. The results of the tests of parallelism of the regression of Level of Independence Posttest on Level of Independence Pretest are summarized in Table 43.

TABLE 43

Parallelism of the Regression of Level of Independence Posttest
on Level of Independence Pretest
by Level of Implementation

Grade 4					
Level of Implementation	N	Pre Mean	Post Mean	Reg. Coeff.	F*
Low	89	7.5	8.8	.09	3.74**
Middle	12	7.9	8.2	.39	
High	90	7.3	8.9	.34	
Grade 5					
Low	122	7.7	9.1	.14	.55
Middle	22	7.6	9.8	.32	
High	48	7.9	9.2	.21	
Grade 6					
Low	81	8.3	9.6	.33	.01
Middle	20	8.2	9.8	.31	
High	88	8.1	9.6	.32	

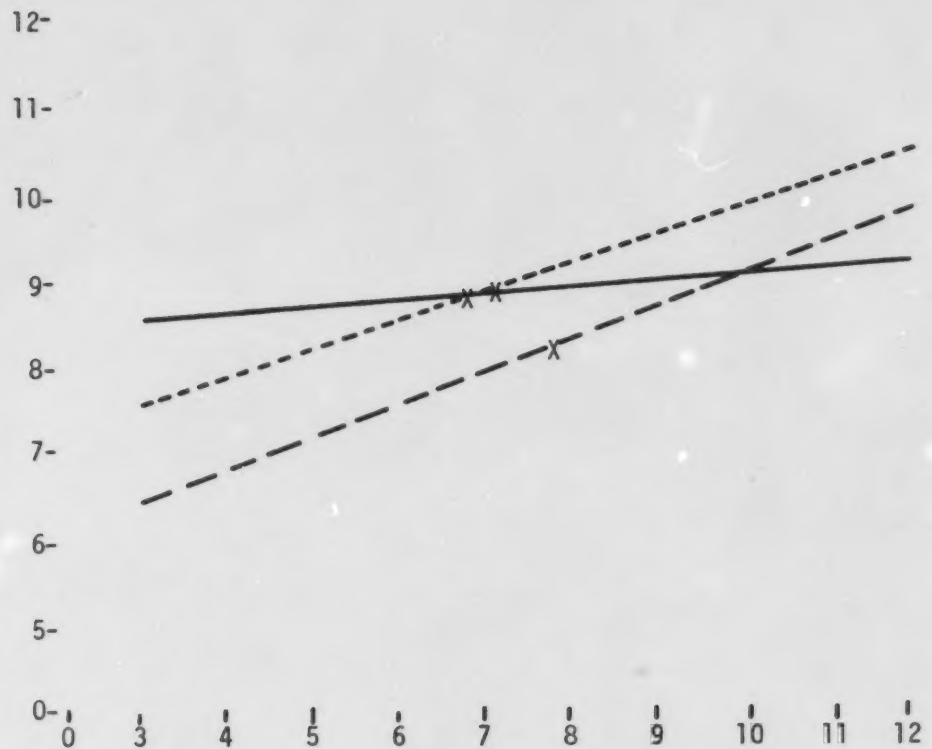
* F-ratio for test of parallelism with degrees of freedom, 2 and 185, 2 and 186, and 2 and 183 at grades 4, 5, and 6 respectively.

** Significant at .05 level.

At grade 4, the regression lines were found to be significantly different. No significant differences were found for grades 5 and 6. A plot of the regression lines for grade 4 is presented in Figure 5. As can be seen, the regression lines for the middle and high implementation levels are fairly parallel. The line for the low implementation group is nearly flat.

FIGURE 5

Within Group Regressions
of Level of Independence Posttest
on Level of Independence Pretest
Grade Four



Low Group —————
Middle Group - - - - -
High Group - - - - -
Group Means X

Considering only the high and low implementation lines (since the middle level included only twelve students), the interaction suggests that students who had a relatively high level of independence at the time of the pretest benefitted from being in a class with a high level of independent learning. Students with a low level of independence did not. This is consistent with what might be expected. More independent students should perform better than less independent students when placed in classes where they are expected to function somewhat independently of continuous teacher guidance and assistance. The difficulty with this finding is the lack of replication at grades 5 and 6. Since level of implementation and level of independence pre did not show a significant interaction with level of independence post in these grades, it is impossible to determine whether the findings for grade 4 are because only these younger students were affected thusly by an independent learning treatment, are the function of some "quirk" in the data for those particular students, and/or raise doubts about the generalizability of the finding for grade 4.

In summary, it is interesting to note that again it was in grade 4 where a significant difference based on treatment associated variables was identified. This difference was in the interaction between students' entering levels of independence, the treatment, and the students' end-of-year levels of independence. By themselves, the level of implementation of the independent learning system and target/non-target student designations did not serve as significant predictors of students' level of independence outcomes, even at grade 4.

Product Evaluation

The products resulting from student projects are an intuitively appealing source of information about students' accomplishments in independent learning. Projects completed independent of continuous teacher direction allow students to display originality and to demonstrate their capacity to use resources and to synthesize and evaluate information. These are abilities closely in tune with the goals of Minicourse 15. Thus in many ways, the evaluation of independent products would seem to be close to an ultimate criterion of independent learning. From a practical point of view, however, product evaluation presents enormous difficulties.

The products of such student projects may take many different forms and, therefore, may be compared along numerous dimensions. Determining which dimensions to rate is a matter of judgment. Further, the ratings themselves are judgmental which leads to questions about generalizability of ratings of products both across judges and across different products completed by the same student. As described in the instrumentation section of this report, practical constraints made it impossible to obtain and evaluate even a single product from all students, much less products of multiple projects for the same students.

As was explained in Chapter Two, products were evaluated for a total of 94 target students from all three grades combined. Because of missing data on one or more predictor variables, data for only 80 of these 94 students were included in the regression analyses reported herein. As previously discussed in Chapter Three, the independent products were evaluated by a paired-comparison technique along four dimensions: global quality, cognitive quality, originality, and the use of a variety of

resources. The connotative meanings associated with each of these dimensions are provided in Chapter Three.

Because of the limited sample size within each grade level, it was decided to run the analyses of the product evaluation dimensions for the total sample of 80 students, i.e., combined across grades. Since products were evaluated only for target students, the target dummy variable was dropped from Cluster 2 for these analyses (see Table 37). It was replaced, however, by two dummy variables which identified a student's grade in school. Further, since product evaluations were obtained only at the time of posttesting, there was no product evaluation pretest to include in Cluster 1. Verbal Ability and Level of Independence Pretest were used as the student input variables. Cluster 3 was defined as in the previous analyses of the traditional achievement measures and the level of independence measure. Finally, the fourth cluster consisted of the four classroom climate scales, Work Study Skills Posttest, and Social Studies Achievement Posttest. A complete list of the variables included in each predictive cluster is provided in Table 37.

Before performing the regression analyses with the four product evaluation dimensions as dependent variables, the intercorrelations of these dimensions, reported in Table 44, were examined to see if use of the separate dimensions appeared to be justified. The correlations were positive. Some were relatively high, making it apparent that the dimensions had considerable commonality. For this reason, the possibility of combining all four dimensions into a single composite dimension was considered, but it was decided that because of the somewhat lower correlation of cognitive quality with originality and with resources, it at least should

TABLE 44

Intercorrelations of the Product Evaluation Dimensions
(Grades 4, 5, and 6 Combined, N=94)

Dimension	Global	Cognitive	Originality	Resources
Global	1.00			
Cognitive	.74	1.00		
Originality	.75	.48	1.00	
Resources	.62	.57	.76	1.00

be kept separate. Moreover, since a somewhat different rating process was involved in calculating the global quality dimensions, it was decided that it also should be kept separate. Originality and resources were combined; resulting in the use of three dependent variables from the product evaluations for the regression analyses: global quality, cognitive quality, and originality/resources.

The squared multiple correlations and increments in squared multiples obtained from the regression analyses are reported in Table 45 for the three product evaluation dimensions.

An immediately striking result is the relatively low predictive power of Cluster 1 compared to what was previously observed for the traditional achievement measures and the level of independence measure. This is particularly true for originality/resources, where the multiple correlation for Cluster 1 is essentially zero, and to a lesser extent for global quality. The only squared multiple correlation for Cluster 1 significantly different than zero is that for cognitive quality as the dependent variable.

TABLE 45

Product Evaluation Dimensions
 Squared Multiple Correlations and Increments in
 Squared Multiples by Cluster of Predictor Variables
 (Grades 4, 5, and 6 Combined, N=80)

Cluster ^a	Number of Variables in Cluster	Dependent Variable					
		Global Quality		Cognitive Quality		Originality/ Resources	
		SMC ^b	Inc ^c	SMC	Inc	SMC	Inc
1	2	.039	.039	.099	.099	.004	.004
2	3	.150	.111	.147	.048	.033	.029
3	2	.203	.058	.228	.081	.045	.012
4	6	.290	.082	.302	.074	.055	.010

^a See Table 37 for a list of the variables in each cluster

^b Squared multiple correlations.

^c Increment in squared multiple correlations.

A number of factors might lead to such a low predictive power for Cluster 1. One obvious reason is the lack of a product evaluation measure at the time of the pretest. Another is that the product evaluation measure involves skills and abilities that have little relationship to (or are not dependent upon) students' verbal ability and initial levels of independence. Given the diverse ways in which students can demonstrate learning in the products they produce through individual independent projects, such a rationale might be proposed for the low predictive power of verbal ability. It is less plausible for level of independence. However, even here, a student with a low level of independence might be expected to produce a high quality product, given appropriate teacher assistance. In any event, it is apparent that students' performance on the verbal ability and the pretest of level of independence had little predictive power for product

evaluation measures which were obtained at the end of the year, especially when the evaluations tapped dimensions other than cognitive quality.

A second result that contrasts with the results for the previous dependent measures is the magnitude of the increment in the SMC associated with the quasi-level of implementation cluster (Cluster 2). For Global Quality, Cognitive Quality, and Originality/Resources, the increments were .111, .048, and .033, respectively. Since the sample size for product evaluation is smaller than that for the other dependent variables, only the increment for global quality reaches significance at the .05 level ($F=3.22$ with 3 and 74 degrees of freedom). Even so, the increments for Cluster 2 are large enough to be of interest and, particularly for global quality, larger than for the other outcome measures.

An obvious question is whether these increments are due primarily to level of implementation or to the dummy variables for grade level that were included in Cluster 2. From an inspection of the regression weights (see Appendix G), it is apparent that the dummy variables for grade level contribute relatively little--e.g., .02 increment in the SMC for the grade 5 dummy, and .001 for the grade 6 dummy for global quality, and .005 and .003 increments for grade 5 and 6 for cognitive quality. The increments in the SMC appear to be due mainly to level of implementation of the independent learning system.

To further explore the importance of level of implementation, Table 46 reports the means and standard deviations on global quality for the three levels of implementation.

As can be seen in Table 46, the means are equal (to one decimal place) for the low and middle levels of implementation while the mean for the

TABLE 46

Global Quality by Level of Implementation
Means and Standard Deviations

Level of Implementation	N	Mean	SD
Low	28	48.4	8.4
Middle	7	48.4	5.9
High	45	52.3	3.7

high level of implementation is higher than the other two means. There also is a tendency for the magnitude of the standard deviations to decrease as one moves from the low to the middle to the high level of implementation. A simple one-way analysis of variance using the three implementation groups yields an F-ratio of 4.12, which, with 2 and 77 degrees of freedom, is significant at the .05 level. Thus, it would appear that there are real differences between the global quality ratings for different levels of implementation, with the target students in the high implementation classes receiving significantly higher global quality ratings than those in the other classes. Although the results of this analysis are questionable given the failure to meet the required assumptions regarding homogeneity of variance and similarity in group size, the increase in global quality rating for the students in high implementation classes suggests that placement in classes where 50 percent, or more, of the students regularly engage in independent learning projects encourages students to produce better products than placement in other classes.

Returning to the regression results in Table 45, fairly sizable increments in the squared multiple correlations also are associated with

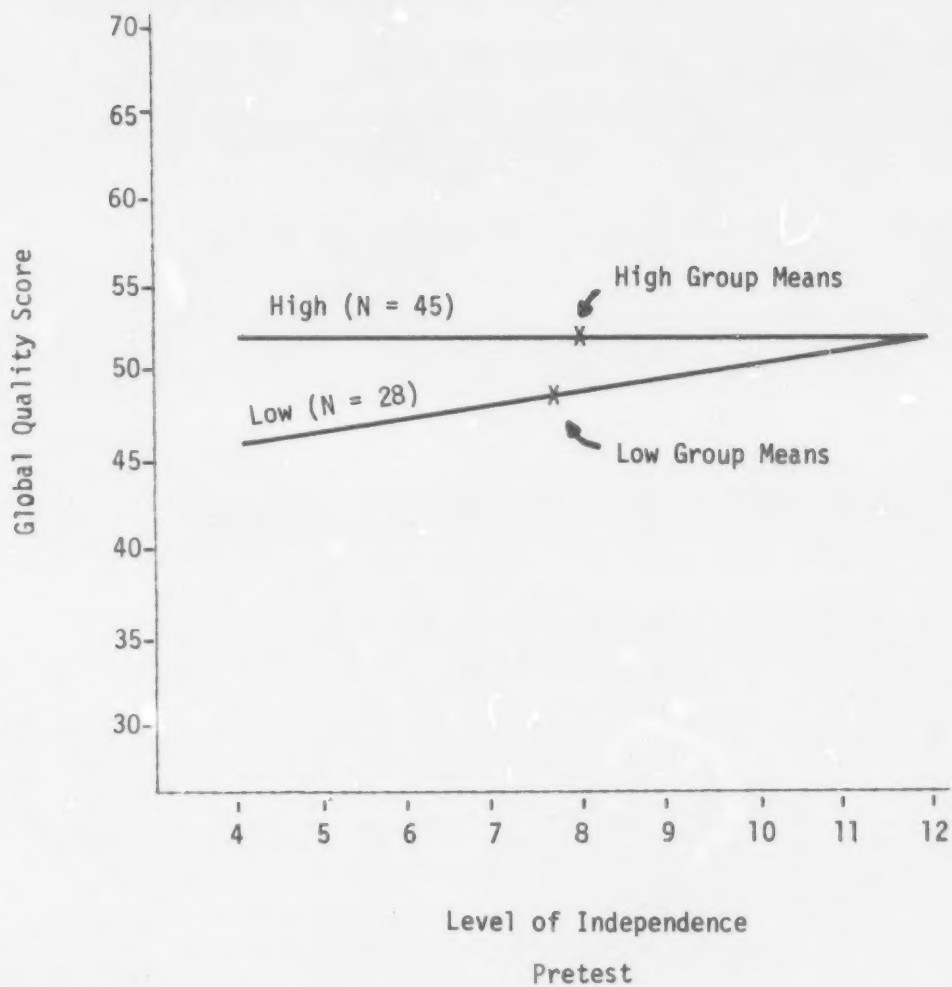
Cluster 3 (the cluster that investigates a possible interaction between level of implementation and pretest level of independence or verbal ability and the product measures) for global quality (increment = 0.58) and cognitive quality (increment = .081). While only the increment for cognitive quality is significant at the .05 level, both increments are at least suggestive of a possible interaction between level of implementation and one of the student input measures. Building upon these findings, tests for parallelism of the regressions of each of these product evaluation measures and each of the student input variables over the three levels of implementation were run.

For global quality, the only significant difference in slopes of the regression lines was obtained in contrasting the regressions of global quality on Level of Independence Pretest for the low versus the high levels of implementation. The regression coefficient for the low implementation group is 1.46 compared to a value of .02 for the high implementation group. From the plot of the low and high implementation regression lines shown in Figure 6, it can be seen that except at the highest scores of the level of independence pretest, the high implementation regression line is above the low implementation regression line. Thus, the general statement that the global quality performance on independent study products would be better for a student in a high level of implementation class holds except for those students who are approximately two or more standard deviations above the means on Level of Independence Pretest. Students with very high levels of independence appear to do well on independent projects, when assigned, regardless of the classroom setting in which they are working.

For cognitive quality, significant differences were found in the slopes of the regression lines comparing the regression of cognitive

FIGURE 6

Within Group Regressions
Global Quality on Level of Independence Pretest
High and Low Levels of Implementation



quality on Level of Independence Pretest for low versus high and low versus middle implementation groups. A plot of the low, middle, and high implementation regression lines is presented in Figure 7.

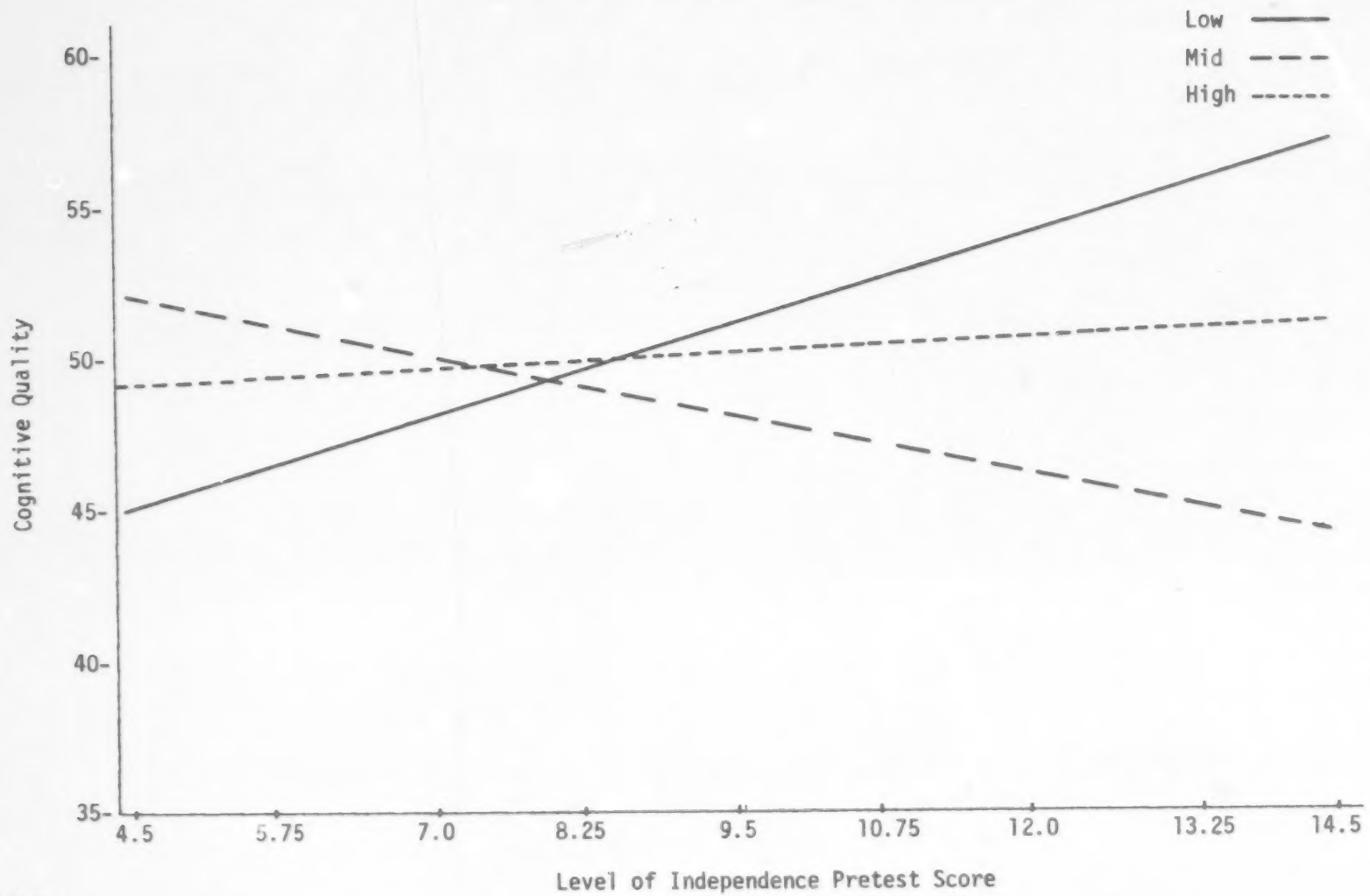
The regression line for the high implementation group is quite flat, suggesting that a high level of implementation has similar effects on the cognitive quality of products for students with varying degrees of level of independence as measured by the pretest. The middle implementation line suggests that this level of implementation is least effective for students with high Level of Independence Pretest scores. A low level of implementation appears to be more effective for high than low LOI students.

The apparent interaction suggests that students with a relatively low level of independence at the time of the pretest do best in a middle level of implementation setting and least well in a low level of implementation setting. Given that in the middle level of implementation classes only the six target students engaged in independent learning projects, this finding is not unexpected. The target students in these classes might be expected to have received more teacher assistance than the target students in the other classes, enabling the low LOI target students in the middle level classes to perform better on independent projects as a result of greater interaction with and assistance from the teacher.

On the other hand, it is interesting to note that the high level of independence students did least well in the middle level classes and best in low level classes. Apparently, these students perform better in terms of cognitive quality of products the less the teacher is involved in their independent activities. Since we can only assume that in order to perform the task and not disrupt regular classwork, students in low level of implementation classes completed their independent products in situations that

FIGURE 7

Within Group Regression
Cognitive Quality on Level of Independence Pretest
Low, Middle, High Levels of Implementation



would closely parallel those of the high implementation classes, it is not possible to draw precise conclusions regarding the differences that existed among these treatment groups. One possible difference in the students' experience may be that the particular project used for the analyses reported here was the only independent project carried out during the school year by the students in low implementation classes while students in high implementation classes probably would have completed several projects. Levels of attention to and interest in the projects, therefore, may have differed for the two groups of high level of independence students.

Nonetheless, the data for both global and cognitive quality outcomes suggest that more attention should be given to the setting in which students with varying levels of independence are expected to learn and perform independently.

The last cluster of variables, i.e., the classroom climate measures and concurrent measures of student outcomes that may relate to students' perspectives of classroom climate (level of independence posttest and achievement posttests) also had sizable increments in the SMC for global quality and cognitive quality. Because of the number of variables in Cluster 4 and the relatively small sample size for the product evaluation measures, however, none of the Cluster 4 increments was statistically significant.

Summary

In summary, there are several indications that level of implementation of the independent learning system made a difference in both the global quality and cognitive quality of products that students produced independent of continuous teacher direction and assistance. The level of implementation

and classroom climate variables were not useful predictors of the product ratings on the combined variable of originality and use of resources. Student input variables were poor predictors of ratings on all three product variables.

Affective Measures

Work by researchers such as Rogers (1969), MacDonald (1970), and Barth (1972) has indicated that if students have more influence in decisions about their own learning, and if they plan and carry out projects in areas of their own interest, more positive attitudes will result. Shavelson (personal communication), however, has found that general or global attitude or self-concept almost never is affected by experimental treatment but that specific attitudes often are affected. With this in mind, it was hypothesized that the following affective variables would exhibit gains due to the independent learning treatment: self-concept related to learning and school activities, attitude toward teacher, attitude toward school, attitude toward learning, and attitude toward social studies. The results of the analyses for these variables follow.

Self-Concept

Self-concept is a generic term that can refer to global or specific constructs. For this study, it was desired to measure self-concept with regard to learning and school behaviors. Two measures of self-concept were used: (1) a 20-item scale adapted from Liddle, et al. (1967) and (2) 24-items (4 subscales) taken from Sears' Self-Concept Inventory. Tables 47 and 48 present the pretest and posttest means and standard deviations for the two self-concept measures by grade level and level of implementation of the treatment.

TABLE 47

Self-Concept Scale
Pretest and Posttest Means and Standard Deviations
by Grade and Level of Implementation
(20-item Liddle Scale)

Level of Implementation	Grade 4					
	Pretest			Posttest		
	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Low	59.20	8.04	88	57.95	9.72	89
Middle	58.67	9.00	12	59.25	10.08	12
High	59.24	7.84	89	59.83	8.76	90
TOTAL GROUP	59.18	7.97	189	58.92	9.30	191
Grade 5						
Low	58.54	7.90	123	58.55	8.24	123
Middle	56.92	7.18	22	57.27	6.78	22
High	57.95	7.24	48	59.87	8.70	48
TOTAL GROUP	58.20	7.64	193	58.73	8.20	193
Grade 6						
Low	59.66	8.31	30	59.24	6.10	31
Middle	57.65	8.34	20	59.08	8.32	20
High	58.33	8.65	88	57.31	7.63	88
TOTAL GROUP	58.83	8.46	188	58.33	7.12	189

TABLE 48

Self-Concept Inventory
Pretest and Posttest Means and Standard Deviations
by Grade and Level of Implementation
(24-item Sears Inventory)

Grade 4						
Low	71.63	13.16	89	69.50	13.39	89
Middle	72.58	12.27	12	69.70	13.14	12
High	66.77	12.60	90	70.53	15.06	90
TOTAL GROUP	69.40	13.02	191	70.00	14.13	191
Grade 5						
Low	68.94	16.09	123	67.10	14.55	122
Middle	72.68	13.16	22	68.37	15.28	22
High	67.49	13.77	48	66.29	14.24	48
TOTAL GROUP	69.01	15.23	193	67.05	14.49	192
Grade 6						
Low	70.27	13.60	81	66.86	13.22	81
Middle	66.06	15.66	20	64.50	15.00	20
High	65.77	14.02	88	64.58	14.47	88
TOTAL GROUP	67.73	14.12	189	65.55	13.97	189

Maximum possible scores were 80 for the self-concept scale and 120 for the inventory. In general, students' self-concept as measured by these instruments remained almost the same or dropped slightly from pretest to posttest. The average student scores also were similar across grade levels and levels of implementation.

For this analysis, Cluster 1 of the predictor variables included the appropriate self-concept pretest and verbal ability measure. Cluster 2 included the same quasi-treatment variables as in the traditional achievement and level of independence analyses, namely, the level of implementation and target/non-target dummy variables.

For the two self-concept dependent variables and all other affective variables, the Cluster 3 variables from the earlier analyses were eliminated. Cluster 3 for the affective variable analyses, therefore, included the classroom climate predictors.

The results of the analyses for the self-concept scale and the self-concept inventory are presented in Tables 49 and 50, respectively.

TABLE 49

Self-Concept Scale (Liddle) Posttest
Squared Multiple Correlations and Increments in
Squared Multiples by Clusters of Predictor Variables

Cluster ^a	Number of Variables in Cluster	Grade 4 (N=184)		Grade 5 (N=189)		Grade 6 (N=185)	
		SMC ^b	Inc. ^c	SMC	Inc.	SMC	Inc.
1	2	.369	.369	.387	.387	.453	.453
2	2	.393	.024	.470	.083	.461	.008
3	4	.471	.078	.484	.014	.501	.040

^a See Table 37 for list of variables in each cluster.

^b Squared multiple correlation.

^c Increment in squared multiple correlation.

TABLE 50

Self-Concept Inventory (Sears) Posttest
Squared Multiple Correlations and Increments in
Squared Multiples by Clusters of Predictor Variables

Cluster ^a	Number of Variables in Cluster	Grade 4 (N=186)		Grade 5 (N=183)		Grade 6 (N=186)	
		SMC ^b	Inc. ^c	SMC	Inc.	SMC	Inc.
1	2	.331	.331	.331	.331	.488	.438
2	2	.356	.025	.331	.000	.447	.009
3	4	.398	.042	.374	.043	.473	.026

^a See Table 37 for list of variables in each cluster.

^b Squared multiple correlation.

^c Increment in squared multiple correlation.

As expected, the student input cluster explained a substantial percentage of the variance for both self-concept posttests. A review of Tables 49 and 50 also shows that the SMC due to Cluster 1 increases from grade 4 to grade 6. This trend is not unexpected. Previous research has shown, as students get older, their self-concept tends to become more stabilized in the sense that a larger percentage of post self-concept variance is explained by pre self-concept.

The largest amount of additional variance explained by the quasi-treatment cluster occurred with the self-concept scale. In grade 5, the SMC increased by .083 which was a significant increase ($F = 14.4$ with 2 and 184 degrees of freedom with students as the unit of analysis). Cluster 2 accounted for an increase in the amount of variance predicted of .024 for the self-concept scale and .025 for the self-concept inventory at the fourth grade level. While these increases were statistically significant at the .05 level ($F = 3.5$ with 2 and 179 degrees of freedom

and 2 and 181 degrees of freedom respectively), the actual increase was rather small. Cluster 2 had little value as a predictor variable at the sixth grade level for either self-concept posttest measure.

For the classroom climate cluster, the increment in the squared multiple correlation was statistically significant ($p < .05$) for grade 4 ($F = 6.5$, $df=4$, 175) and grade 6 ($F = 3.5$, $df=4$, 176) on the self-concept scale and for grade 4 ($F = 3.1$, $df=4$, 177) and grade 5 ($F = 3.1$, $df=4$, 177) on the self-concept inventory with student as the unit of analysis.

Thus, for the self-concept measure, it appears that quasi-treatment conditions had some limited use as a predictor of students' end-of-year self-concepts. However, this cluster added only modest amounts to the SMC. Again, the effect was observed primarily at the fourth grade level.

The classroom climate cluster was a stronger predictor for self-concept than it was for the achievement and independent study variables. While the actual difference in the SMC increment resulting from this cluster was not large, it is interesting to note that climate had a statistically significant influence for both self-concept measures even though the somewhat random occurrence of the significant increments across grade levels make this finding somewhat difficult to interpret.

Attitude Toward Teacher

In this study, attitude toward teacher measured the students' subjective feelings about teacher behavior, especially with respect to teacher-to-student interpersonal relationships. Eleven items from the Student Attitude Questionnaire were related to this outcome. The items were randomly ordered within the instrument and placed in a Likert-type scale format. (See Chapter Three for a more complete discussion of the instrument.)

The pretest and posttest means and standard deviations for attitude toward teacher are reported in Table 51 by level of implementation and grade level. The maximum possible score was 44. The pretest means were similar across grades and levels of implementation. At the posttest, small decreases in scores occurred within most of the treatment groups. The only groups to exhibit small, positive gains were the fourth-grade, middle implementation and the fifth grade, high implementation students.

TABLE 51

Attitude Toward Teacher
Pretest and Posttest Means and Standard Deviations
by Grade and Level of Implementation

Level of Implementation	Grade 4					
	Pretest			Posttest		
	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Low	34.71	4.22	88	33.39	6.24	89
Middle	34.43	4.48	12	36.45	3.49	12
High	32.72	6.64	89	32.25	7.23	90
TOTAL GROUP	33.76	5.56	189	33.05	6.66	191
	Grade 5					
	Pretest			Posttest		
	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Low	33.81	5.58	123	31.96	6.06	123
Middle	34.82	3.68	22	33.82	6.45	22
High	33.17	4.80	48	33.61	4.60	48
TOTAL GROUP	33.76	5.21	193	32.58	5.81	193
	Grade 6					
	Pretest			Posttest		
	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Low	33.95	4.97	80	32.10	6.61	81
Middle	34.89	3.93	20	33.08	5.07	20
High	33.32	5.26	88	30.24	5.80	88
TOTAL GROUP	33.76	5.01	188	31.34	6.16	189

Table 37 lists the predictor variables included in each cluster for the analyses relative to attitude toward teacher. Clusters 1 and 2 consist of the same types of variables as in previous analyses with the attitude toward teacher pretest score inserted as the appropriate predictor variable in Cluster 1. Cluster 3 includes the same classroom climate variables as in analyses for self-concept. In addition, for this and the remaining attitude analyses, the self-concept scale posttest score is included in Cluster 3 on the assumption that students' attitudes toward the teacher and other aspects of schooling may be related to whether they have a high or low self-concept along with the classroom climate variables.

The regression analysis for attitude toward teacher parallels that done for the self-concept measures. Table 52 presents the squared multiple correlations associated with each predictor cluster.

While Cluster 1 accounted for most of the predicted variance for attitude toward teacher across the grade levels, this cluster accounted

TABLE 52

Attitude Toward Teacher Posttest
Squared Multiple Correlations and Increments in
Squared Multiples by Clusters of Predictor Variables

Cluster ^a	Number of Variables in Cluster	Grade 4 (N=184)		Grade 5 (N=188)		Grade 6 (N=185)	
		SMC ^b	Inc. ^c	SMC	Inc.	SMC	Inc.
1	2	.138	.138	.280	.280	.064	.064
2	2	.38	.000	.301	.021	.091	.027
3	5	.241	.103	.349	.048	.176	.085

^a See Table 37 for list of variables in each cluster.

^b Squared multiple correlation.

^c Increment in squared multiple correlation.

for an unusually small amount of variance compared with the achievement variables. Exactly why the prediction for sixth grade was so low is not known. Looking at the means for the sixth grade, very little change occurred in attitude toward teacher, and the change that did occur was negative. This appears to suggest that something other than the predictor variables applied in the analysis influenced students' attitude toward the teacher.

The squared multiple correlations indicate that the quasi-treatment cluster (Cluster 2) accounts for very little variance beyond that explained by Cluster 1. None of the increments in SMC due to Cluster 2 was statistically significant.

For all three grades, the increment in SMC due to the classroom climate cluster was larger than the increment due to the quasi-treatment cluster. Each of these differences was statistically significant ($F = 4.7, 2.6, 3.6$ with $df=5,174, 5,178, \text{ and } 5,175$ respectively). Classroom climate served as a good predictor of students' posttest attitude toward the teacher. However, it must be noted that the increment associated with the classroom climate cluster is more of a shared variance than an explained variance. This is due, in part, to the fact that the measures were obtained at the end of the year and, therefore, are only suggestive of process variables that may be important. The direction of effects between these variables and the dependent variable, i.e., attitude toward teacher, is uncertain. What is known is that classroom climate is related to students' attitudes toward teacher. Given the limitations of both the measures and the statistical procedures and the general decrease in attitude that occurred from pretest to posttest, it is difficult to explain exactly what these results mean in terms of future teaching and learning situations.

Attitude Toward Social Studies

Since the present study focused on the social studies area, it was hypothesized that students' attitudes toward that subject would be affected. Students' attitudes toward social studies were measured by 10 items developed by the Educational Evaluation Center (Traub et al., 1973a) which emphasized students' feelings about the activities and content of instruction in social studies. Table 53 presents the pretest and posttest means and standard deviations by grade and level of implementation for this measure. The maximum possible score was 40.

Overall, there appear to be small differences in pre as compared with post scores. Across all grades and implementation levels, seven groups showed a slight decrease in scores; five showed an increase; and grade 4 students, on the whole, increased in attitude toward social studies.

For purposes of the regression analyses, the clusters of predictor variables generally remained the same as for attitude toward the teacher (see Table 37). Attitude toward social studies pretest score was combined with verbal ability in Cluster 1, replacing the previous attitude toward teacher pretest.

Table 54 reports the results of the analysis for attitude toward social studies. As expected, Cluster 1 served as a fairly good predictor at grades 5 and 6. It was not a good predictor at grade 4. Relatively little additional variance was explained by the quasi-treatment cluster (Cluster 2). When the student was used as the unit of analysis, the grade 5 increment of .052 for Cluster 2 was statistically significant ($F = 6.42$ with 2 and 183 degrees of freedom) but small in actual amount of variance predicted. Thus, there is little evidence that the treatment conditions helped predict posttest performance in attitude toward social studies.

TABLE 53

Attitude Toward Social Studies
Pretest and Posttest Means and Standard Deviations
by Grade and Level of Implementation

Level of Implementation	Grade 4					
	Pretest			Posttest		
	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Low	29.12	5.32	88	29.92	5.68	89
Middle	26.75	6.36	12	25.58	5.11	12
High	28.31	5.04	89	29.47	6.02	90
TOTAL GROUP	28.59	5.27	189	29.44	5.87	191
	Grade 5					
Low	28.47	5.16	123	27.16	6.23	123
Middle	30.14	3.77	22	29.32	5.82	22
High	27.25	4.42	48	29.30	5.14	48
TOTAL GROUP	28.35	4.89	193	27.92	5.99	193
	Grade 6					
Low	28.28	5.27	80	27.22	5.96	81
Middle	23.90	5.04	20	27.10	4.02	20
High	26.27	5.87	88	25.17	5.95	83
TOTAL GROUP	26.86	5.69	188	26.25	5.84	189

TABLE 54

Attitude Toward Social Studies
Squared Multiple Correlations and Increments in
Squared Multiples by Clusters of Predictor Variables

Cluster	Number of Variables in Cluster	Grade 4 (N=184)		Grade 5 (N=188)		Grade 6 (N=185)	
		SMC ^a	Inc. ^b	SMC	Inc.	SMC	Inc.
1	2	.064	.064	.207	.207	.260	.260
2	2	.066	.002	.259	.052	.274	.014
3	5	.286	.220	.371	.112	.433	.159

^a Squared multiple correlation.

^b Increment in squared multiple correlation.

The classroom climate cluster, on the other hand, exhibited rather large increments in the squared multiple correlation, particularly at grade 4 where an increment of .220 was found. In all instances, the increase was statistically significant with $F = 10.7$ with 5,174 degrees of freedom at grade 4; $F = 6.3$ with $df=5,178$ at grade 5; and $F = 9.8$ with $df=5,175$ at grade 6. As with attitude toward teacher, it appears that the climate of the classroom in some way affects students' attitudes at the end of the school year. In this instance, the increase in attitude at grade 4 combined with the high predictive power of the classroom climate cluster at that grade level emphasizes the importance of the relationship.

Attitude Toward Learning

Attitude toward learning, as used in this study, was a measure of students' attitudes toward the learning experience independent of their attitude toward school and teachers. Nine items from the Instructional Objectives Exchange Sourcebook (1972) were used to measure students'

attitudes toward learning. These items were concerned with students' intellectual curiosity, willingness to study, volunteerism, and interest in problem solving.

The pretest and posttest means and standard deviations for attitude toward learning are presented in Table 55. A maximum score of 36 was possible. The means across all groups show almost no differences that exceed a one point increase or decrease in score. The differences that did occur were in grade 6 and were only slightly more than one point. Apparently, students' attitudes toward learning changed very little during the year that the study was conducted.

Again, the clusters of predictor variables are the same as those used in the previous attitude analyses except that in Cluster 1, attitude toward learning pretest score replaces the other pretests (see Table 37).

The results of the commonality analysis are reported in Table 56.

Trends similar to those reported for the other affective variables can be observed. Cluster 1 explains more variance than the other clusters and, for this variable, is equally effective as a predictor at all three grade levels. Cluster 2 adds very little to the SMC. In fact, Cluster 2 adds the least to the squared multiple correlation for attitude toward learning at all three grade levels of any dependent variable considered thus far. This is somewhat surprising. Given the differences in the teaching/learning situations in the high and low implementation classes, in particular, it would follow that these two types of settings might have different effects upon students' attitudes toward learning. Perusal of the pre and posttest means for the implementation groups indicates that no such differences were found. Knowing which implementation level

TABLE 55

Attitude Toward Learning
Pretest and Posttest Means and Standard Deviations
by Grade and Level of Implementation

Level of Implementation	Grade 4					
	Pretest			Posttest		
	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Low	27.88	4.54	88	27.64	4.64	89
Middle	27.67	3.75	12	28.58	3.40	12
High	27.79	4.48	89	27.92	4.37	90
TOTAL GROUP	27.82	4.44	189	27.83	4.43	191
	Grade 5					
	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Low	27.71	4.53	123	27.38	4.59	123
Middle	28.32	4.62	22	28.41	4.05	22
High	27.50	3.96	48	28.32	3.89	48
TOTAL GROUP	27.73	4.39	193	27.73	4.37	193
	Grade 6					
	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Low	28.10	4.06	80	27.00	4.42	81
Middle	26.75	4.45	20	27.80	2.62	20
High	27.58	4.14	88	26.29	3.63	88
TOTAL GROUP	27.71	4.14	188	26.76	3.92	189

TABLE 56

Attitude Toward Learning
Squared Multiple Correlations and Increments in
Squared Multiples by Clusters of Predictor Variables

Cluster	Number of Variables in Cluster	Grade 4 (N=184)		Grade 5 (N=188)		Grade 6 (N=185)	
		SMC ^a	Inc. ^b	SMC	Inc.	SMC	Inc.
1	2	.216	.216	.258	.258	.283	.283
2	2	.222	.006	.271	.013	.288	.005
3	5	.417	.195	.371	.100	.366	.078

^a Squared multiple correlation.

^b Increment in squared multiple correlation.

classroom a student was in was of little help in predicting his or her end-of-the-school-year score on attitude toward learning.

As with the previous affective dependent variables, the squared multiple correlation increments due to the classroom climate cluster were significant for all three grades ($F = 11.6, 5.7,$ and 4.3 with $df = 5,174, 5,178,$ and $5,175$ respectively at grades 4, 5, and 6 with students as the unit of analysis). Again, the largest increment (.195) was observed at grade 4. As might be expected, classroom climate and posttest self-concept are related to attitude toward learning.

Attitude Toward School

Twelve items were selected from the Instructional Objectives Exchange Sourcebook (1972) to form an attitude toward school scale. This scale measured students' general orientation toward schooling independent of the particular school which they were attending.

Table 57 lists the pretest and posttest means and standard deviations for this variable. The maximum possible score was 48. As with the other

TABLE 57

Attitude Toward School
Pretest and Posttest Means and Standard Deviations
by Grade and Level of Implementation

Level of Implementation	Grade 4					
	Pretest			Posttest		
	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Low	33.80	9.50	88	33.96	9.45	89
Middle	34.50	8.83	12	35.24	10.11	12
High	34.22	9.29	89	33.73	9.94	90
TOTAL GROUP	34.04	9.32	189	33.93	9.68	191
Grade 5						
Low	34.35	7.77	123	33.10	8.71	123
Middle	35.83	8.86	22	35.04	9.66	22
High	32.81	8.33	48	34.31	8.16	48
TOTAL GROUP	34.14	8.04	193	33.62	8.67	193
Grade 6						
Low	34.21	7.61	80	30.60	8.09	81
Middle	32.24	9.94	20	35.41	6.05	20
High	32.14	8.74	88	30.66	8.28	88
TOTAL GROUP	33.03	8.43	188	31.14	8.09	189

affective variables, there is a general trend for attitude toward school to be lower at the end of the year than at the beginning. Also students in grade 6 generally exhibit lower attitudes than those in grades 4 and 5.

The clusters of predictor variables remain the same as for other affective dependent variables. In Cluster 1, attitude toward school pretest scores replaces the other pretest variable as one of the two student input variables (see Table 37 for complete listing of variables).

Table 58 reports the results of the analysis for attitude toward school.

In general, these results parallel those for the other affective variables. Cluster 1 explains more variance than the other clusters. Cluster 2, the quasi-treatment cluster, adds very little to the explanation of variance. Cluster 3 explains slightly more than 10% of the variance in attitude toward school posttest scores. Each of the increases in SMC due to Cluster 3 is statistically significant with $F = 6.4, 9.3,$ and 6.5 with degrees of freedom equal to 5,174, 5,178 and 5,175 respectively

TABLE 58

Attitude Toward School
Squared Multiple Correlations and Increments in
Squared Multiples by Clusters of Predictor Variables

Cluster	Number of Variables in Cluster	Grade 4 (N=184)		Grade 5 (N=188)		Grade 6 (N=185)	
		SMC ^a	Inc. ^b	SMC	Inc.	SMC	Inc.
1	2	.333	.333	.449	.449	.275	.275
2	2	.336	.003	.462	.013	.277	.002
3	5	.439	.103	.573	.111	.390	.113

^a Squared multiple correlation.

^b Increment in squared multiple correlation.

for grades 4, 5, and 6. The combined predictor of classroom climate and self-concept posttest score seem to be significantly related in some way to students' end-of-year attitudes toward school. Referring to Appendix G, there appears to be no particular pattern to this relationship, however. The self-concept posttest measure appears to account for a major portion of the predicted variance attributed to the cluster in grades 4 (.09) and 6 (.07); less so at grade 5 (.008). Of the classroom climate variables, pace resulted in the larger increase in the SMC at grade 4 (.002), simplicity at grade 5 (.07), and diversity at grade 6 (.02).

Summary of Affective Outcomes

Affect outcomes exhibited basically decreasing trends in mean scores from grades 4 to 6 for Sears self-concept, attitude toward teacher, attitude toward school, and attitude toward social studies. In general, the student input cluster of predictor variables (Cluster 1) explained most of the variance in the dependent affective variables. However, for attitude toward teacher and attitude toward social studies, the amount of variance explained by Cluster 1 was somewhat less than might have been expected. The amount of variance accounted for by verbal ability together with the appropriate pretest differed from variable to variable. For self-concept at the different grade levels, Cluster 1 accounted for 33-45% of the variance; for attitude toward school, 23-28%; for attitude toward learning, 22-28%; for attitude toward social studies, 6-26%; and for attitude toward teacher, 6-28%.

Little additional variance was explained by the cluster containing the quasi-treatment (level of implementation and target/nontarget) variables. In only four of the eighteen analyses did the quasi-treatment cluster explain a statistically significant amount of additional variance. Of the

four, only two showed an increase greater than .03 in the squared multiple correlation. These were in grade 5 attitude toward social studies and self-concept scale.

Cluster 3, which consisted of the classroom climate variables for the two self-concept dependent variables and the classroom climate variables plus the self-concept scale posttest score for the other four affective variables, explained more of the variance in students' posttest scores on the affective measures than might have been expected. The predictability was lowest for the two self-concept measures, .01 to .08%. For the other variables, the amount of variance explained ranged from .04 to .22%, with nine out of twelve increases in the squared multiple correlations being above .10%.

CHAPTER FIVE

DISCUSSION AND IMPLICATIONS FOR FUTURE RESEARCH

The following discussion of the results of the Independent Learning Study covers three major topics. The first is a review of those research procedures that in our opinion are significant as compared to previous methodology in examining instructional innovations. The second topic summarizes the results of the study in terms of the existence of the treatment and student outcomes. The third topic is an examination of implications for future research in education.

SIGNIFICANT ASPECTS OF THE RESEARCH STRATEGY

The overall research approach to the study of teaching which was employed in the Independent Learning Study was one that has been typical of previous research on instructional innovations. One group of teachers was trained in the use of the innovative instructional procedures, while another group of teachers was not. The trained teachers then were asked to implement the new procedures, and the classes of the trained and untrained teachers were compared in order to assess the effects of the treatment.

Much of the previous research of this nature has failed to identify treatment effects and, moreover, has pointed to weaknesses in this general approach to the study of teaching. The Independent Learning Study, therefore, employed two data bases that were considered to be essential to a study using a treatment/control comparison. In our opinion, these data bases are two of the significant aspects of the research strategy because they moved the inquiry beyond a simple treatment/control comparison.

The first of the two data bases was data about whether or not the treatment actually was in operation in a given class--be it a treatment or a

control classroom. It was not assumed that all the teachers who were trained in Minicourse 15 would employ the independent learning system and that all of the control teachers would not use similar skills. In actual fact, four of the control teachers did use an instructional approach similar to that of the independent learning system, while one of the teachers assigned to the treatment group did not use the independent learning system. By monitoring teachers' use of the skills it was possible to determine the extent to which levels of treatment existed and whether these levels related to student outcomes. Had observations related to the essential features of the independent learning system not been conducted in all classes, the use of the quasi-treatment, level of implementation, variable would not have been possible. Classification of classrooms according to the implementation criteria served an important purpose in this study. It is recommended as a critical variable for future studies.

The second data base which was employed in response to the problems of a treatment/control comparison was provided by the use of student outcome measures of both conventional achievement tests and measures related to the learning goals of the specific treatment--in this case, independent learning. The purpose was to gain information about whether or not the independent learning system maintained the same conventional levels of achievement as other instructional approaches and to discover whether or not independent learning increased student performances in other skill areas related directly to the treatment--e.g., the ability to plan and work independently and the quality and creativity of the work that student produced under such an instructional approach. Thus, rather than making the treatment/control comparison only on the basis of more conventional achievement tests, treatment

specific measures also were included along with affective outcome measures. The importance of this decision is apparent. The preponderance of significant differences in student outcomes based on the level of implementation cluster (see previous chapter) were in the treatment specific and affective areas. While this might have been expected, to conduct a study of an educational innovation that did not consider the precise goals of that innovation would, in our opinion, be a mistake given the findings reported here.

A third significant aspect of the research strategy was the fact that the innovative instructional system was observed over a full school year. One of the frequent problems clouding the results of research involving an innovative instructional approach has been the question of whether the new program had been operative long enough for an effect to have occurred. By extending the Independent Learning Study over a full year following the training of the treatment teachers, there was some assurance that the innovative approach was in existence long enough for students to have begun to function in it.

It must be noted, however, that even though large numbers of students may have been involved in independent learning, particularly in those classes rated as high implementation classes, the application of a new instructional system may be somewhat mechanical when teachers first begin to use it. This is supported both by the data reported here and by the work of Hall et al., (1975) on levels of use of an innovation. Even in this year-long study, therefore, the full impact (positive or negative) of the independent learning system may not have been observed because the study was conducted during the first year that most of the teachers had employed independent learning in their classes.

A fourth significant aspect of the research approach was the study's effort to look at the effects of the treatment conditions on students with differing levels of independence, rather than simply using class means as a measure of outcome. This was done on the assumption that independent learning may be more effective for some students than others. If this were so, class means would mask outcomes and fail to identify differential effects on students. By examining outcomes for students at different levels of independence, the study sought to avoid this potential problem. At the same time, the decision to use individual students as the unit of analysis raised several questions regarding the actual unit of analysis at which teacher effect can, or should, be measured. Because independent learning is intended as an instructional approach that differentiates the teaching-learning experiences across students, it was argued herein that the student was the appropriate unit of analysis particularly in the middle and high implementation classes. From a stability of findings viewpoint, this rationale might be questioned, however.

The fifth aspect of the research approach which we consider to be significant was the use of a range of affective measures. The affective measures used in the study considered not only student attitudes toward self and the subject area in which the independent learning system was applied, but also student attitudes toward learning and toward school. These latter attitudes may well have more long-term importance than attitude toward a specific subject in terms of relationship to student outcomes, and it was considered important to include them among the student variables in a study that introduced an innovative approach to learning in the classroom and the school.

In summary, then, it is our opinion that the study had five strengths in terms of research on teaching:

1. Equivalence/non-equivalence of treatment and control classes was confirmed through use of observation data that were collected in both treatment and control classrooms. These data, in turn, were considered in determining the most powerful data analysis procedure to use in the study.
2. Techniques and instruments were selected or developed and validated for assessing relevant phenomena and processes related to the study. These included conventional and treatment specific outcome measures.
3. The innovative instructional system was observed over a full school year.
4. Outcomes for students with differing levels of independence were used rather than class means; and
5. Affective measures toward learning and school were included as well as toward self and the social studies.

The implementation of the above procedures, in turn, resulted in a fair and rigorous test of the independent learning system. Nonetheless, it should be noted that the after-the-fact decision to utilize the quasi-treatment level of implementation approach to data analysis, while important from several practical and realistic standpoints, weakened the study in terms of the experimental intent and random assignment of subjects to treatment. Further, had the study begun with a level of implementation, rather than a treatment-control focus, more and different observation data might have been collected.

SUMMARY OF RESULTS

The results of the study are summarized here in terms of, first, the existence of the treatment and, second, treatment effects. The preceding chapter presents the complete results statement.

Existence of Treatment

All classrooms in the study sample, whether treatment or control, were categorized as to level of implementation of the independent learning system. The classification was adapted from the levels of use in adopting an educational innovation identified by Hall et al. (1975). For this study, three levels of implementation were assigned: high (regular use of the independent learning system with 50% or more of the students in the class); middle (use with the six target students only); and low (non-use of the system). Data obtained from observation and from observer interviews were used in assigning each class to one of the three levels of implementation.

The results suggest that teachers in high-use classes were less apt to work with a large group of students, lecture, or lead group discussions than teachers in non-use classes. Multiple activity groups were more apt to be found in high-use classes, and the amount of student involvement in selecting learning topics and activities was greater. Students in high-use classes also were more apt to discuss their learning objectives with the teacher on a one-to-one basis than were the students in non-use classes.

Given these findings, it may be assumed that independent learning, as defined herein, was in operation in the high-use classes and was not in operation in the low-use classes. (Classrooms assigned to the middle level of implementation were characterized by high use of the independent learning

system with only the six target students.) Teachers could be trained to implement an independent learning system.

The classification of classrooms by the quasi-treatment level of implementation variable was one of the significant aspects of the research approach used in the study. It should be recalled that four of the high-use classes were from the control group and that one of the non-use classes was from the treatment group. If the assumption had been made that the treatment was present in all of the treatment classrooms and in none of the control classrooms when it was not, effects of the treatment might have been hidden. We believe that the collection of data about the existence of the treatment in all classes that were part of the study sample and the classification of these classes according to level of implementation of the innovation was an important step in this research effort. It should, in our judgment, be considered as a viable alternative to a treatment/control approach to future studies of innovative educational programs and instructional systems.

Treatment Effects

The students in the study came from 58 classrooms at the fourth, fifth, and sixth grade levels. A total of 630 students were included in the final sample: 197 from the fourth grade (93 treatment and 104 control); 212 from the fifth grade (75 treatment and 137 control); and 221 from the sixth grade (120 treatment and 101 control). Selection of target/nontarget students was based on a stratified random basis using entry level of independence and sex (see Chapter Two). Although four of the treatment classrooms and two of the control classrooms were in low SES schools, attrition during the study year resulted in there being too few low SES students at each grade level to provide representativeness for this report. The comments that follow, therefore,

are restricted to results for students in middle and high SES schools. Results for low SES schools are reported in a separate document.

The following brief discussion of the treatment effects considers each of the major types of student outcomes for which data were collected: outcomes on standardized achievement measures, on independent learning measures, and on affective measures.

Standardized Achievement Outcomes

The independent learning system which the treatment teachers were trained to implement does not emphasize achievement, per se. Thus, it was not expected that student achievement in conventional social studies knowledge and skills would differ in the treatment and control classes. The intent in measuring traditional achievement outcomes was to investigate whether the implementation of an independent learning system in the social studies affected performance on conventional measures of achievement--in effect, to demonstrate that it did not adversely impact student achievement. For this purpose, two standardized measures were used: Work Study Skills and Social Studies Achievement.

On Work Study Skills, the predictor variables associated with students' ability accounted for a major portion of their performance on the posttest. The quasi-treatment predictor cluster for level of implementation of the independent learning system had no differential effects in grades 5 and 6. However, there was a significant, but small, effect at grade 4 when the treatment variables (level of implementation and target/nontarget students) were considered. Classroom process variables also showed a significant, but small, effect at grade 4.

The social studies achievement test used in the study was derived by matching the school district's social studies objectives for grades 4, 5, and 6 with social studies objectives and test items available from the Westinghouse Learning Corporation. Overall, the students' scores on this test showed small gains from pretest to posttest. An increase of 1 point was typical for a grade level and level of implementation group; the maximum increase was 3.5 points. Thus, it appears that neither a conventional nor an independent learning approach to social studies instruction had much affect upon the students' knowledge and skill as measured by this particular instrument.

Several explanations for this finding may be offered. Most obvious is the possibility that the topics that were covered during the year did not coincide with those included on the test. While it was not possible to check the exact content of all social studies instruction in each class in order to verify this proposition, listings of independent learning projects and copies of independent study contracts submitted by the participating teachers suggest that the content covered by the students was considerably broader than that included in the achievement test.

Relative to the social studies achievement outcomes, significant but small effects were found at the fourth grade for the quasi-treatment cluster. The classroom climate and process variables (Cluster 4 in the analysis) had a significant effect at grades 4 and 6 but not grade 5; a result which may have been influenced by the small number of high implementation classes in grade 5 as contrasted with grades 4 and 6 (3 in grade 5 as compared with 7 each in grades 4 and 6). In contrast, student input variables had a smaller effect in grades 4 and 6 than in grade 5 (.429 and .499 percent of variance predicted in grades 4 and 6, respectively; .568 percent of variance predicted

in grade 5). This finding gives rise to the conjecture that with the student input variables having a smaller effect in grades 4 and 6, there might have been more possibility of instructional and classroom variables having influenced student performance in these classes than in the grade 5 classes.

Independent Learning Outcomes

The independent learning measures were designed to measure those student outcomes that were expected to be affected by participation in an independent learning program. The measures included a level of independence interview and a product evaluation procedure.

The level of independence interview measured the degree to which a student could plan and carry out an independent learning project (contract). It assessed a student's skill in identifying a study topic, outlining the steps to follow in completing a project, identifying resources, and establishing a deadline. The interview procedure obtained ratings for each of these areas. The overall interrater reliability for this measure was .73.

The product evaluation procedure evaluated the end result of students' having engaged in independent learning experiences. A paired-comparison evaluation procedure was used in which judges rated the students' independent learning projects on global quality, cognitive quality, originality, and use of resources. Interrater reliabilities across these various dimensions of the product evaluation ranged from .83 to .90.

The results indicate that the predictive value of the student ability variables was considerably less for the independent learning outcomes than for the outcomes measured by conventional achievement tests. While some of this difference can be attributed to the psychometric properties of the measures, it also appears that student entry ability as measured by verbal ability,

work study skills pretest, and level of independence pretest are not particularly good predictors of either the quality of the product a student produces as the result of an independent learning contract or of the ability a student will develop in planning and carrying out independent projects given some experience in this type of an instructional system. The highest squared multiple correlation (SMC) for the student ability cluster for these measures was .294 for sixth grade students on level of independence posttest performance. The lowest SMC for this input cluster was .004 for sixth grade students on the originality/resources dimension of product evaluation.

These data suggest that student ability measures conventionally used to predict school outcomes have less predictive power as outcomes move away from those measured by conventional paper and pencil test formats. This should not be surprising since the requisites for success in independent learning are not necessarily as narrowly related to verbal ability and work study skills as are the requisites for successful achievement on standardized tests. It is interesting to recall in this context the hypothesis of Soar (1972) that the more complex or abstract the pupil gain measure, the more indirect the teacher behavior associated with the most growth. This may, also, be the case for student input variables.

For the Level of Independence posttest, the third cluster of predictor variables--comprised of the cross product of level of implementation and students' pretest level of independence scores and the cross product of level of implementation and students' verbal ability--was significant at the fourth grade level when students were used as the unit of analysis. Further investigation indicated that at the fourth grade level, students with an initially high level of independence (as measured by the interview) benefitted

from being in a class with high use of the independent learning system. Students with a low level of independence did not. While this finding is not surprising, it suggests a need to pay more attention to students' ability to perform in a given instructional setting. At least at the fourth grade level, it would appear that a student with an initially low level of independence will not develop a higher level of independence learning if he is placed in a classroom in which a majority of the students are engaged in independent learning activities, or, in other words, in a classroom where the teacher provides limited direction, guidance, and assistance to the student as he or she works independently.

This finding is further explicated by the results of the product evaluation. (It should be noted that for the product evaluation analyses, data for all target students were combined rather than carrying out separate analyses for each grade level.) A comparison of the regression lines for high, middle, and low implementation classes comparing cognitive quality of products on level of independence pretest suggests that students with a relatively low level of independence pretest do best in a middle implementation class. The middle implementation classes were those in which the teachers worked on independent learning projects only with the six target students. Therefore, these students received more teacher assistance than probably would be possible in classes in which a majority of the students were engaged in independent learning activities.

Taken together, these findings relative to the level of independence posttest and the product evaluation suggest that considerable care must be taken if students with a low level of independence are to be successful in an independent learning situation. Such students should be placed in independent learning programs that provide careful monitoring and frequent

contacts with the teacher. A teacher who wishes to implement an independent learning program for an entire class, therefore, should make provision for spending considerably more time with those students who have a low level of independence and planning with them independent learning contracts that call for frequent check points and consultation between teacher and student. Moreover, it is possible that the limitations of teacher time would mitigate against the use of an extensive independent learning program in a classroom in which a sizeable number of students were at a low level of independence. It should be noted, however, that the findings also suggest that students with a high level of independence perform better in terms of the cognitive quality of products the less the teacher is involved in their independent activities. Clearly, teachers need to be informed about their students' levels of independence in order to decide whether an independent learning program is feasible and, if it is, to plan appropriately for spending different amounts of time with students who differ in their levels of independence.

The product evaluation also suggested that the level of implementation of the independent learning system was significantly related to student performance. In the global quality ratings for products, students in high implementation classrooms received significantly higher ratings than did students in middle and low implementation classes. On the other hand, originality and the variety of resources used by students did not appear to be related to the type of instructional system in which they worked. Both level of implementation and classroom climate variables were not useful predictors of product ratings on originality and use of resources. Part of this finding seems reasonable since the variety of resources available may be restricted by the affluence of the school. But in regard to originality, this finding was

somewhat of a surprise. It might be anticipated that students working independently would have a greater opportunity to introduce and apply original, creative ideas. Apparently, for these students, this was not so.

In summary, participation in an independent learning system appears to have some relationship to growth in level of independence by fourth, but not fifth and sixth, grade students. Further, participation in classes in which a majority of students are engaged in independent learning activities is related to a higher level of overall quality of the work they complete independently. The cognitive quality of the students' products also is related to level of implementation (high, middle, or low level of use), but the type of independent learning system that is most effective (with greater or less teacher assistance) differs for students with varying levels of independence.

Affective Outcomes

Five affective outcomes were investigated: self-concept related to learning and school activities, attitude toward teacher, attitude toward school, attitude toward learning, and attitude toward social studies.

The findings indicate that students' self-concepts changed very little during the year, regardless of the quasi-treatment condition. Further, self-concept scores were very similar across all grade levels. Students' pre self-concept served as the best predictor of post self-concept, with the predictive value increase from grade 4 to 6 (.369 to .453).

Using students as the unit of analysis, both the level of implementation and classroom climate clusters had some modest influence on self-concept scores. The classroom climate cluster provided increases in the SMC at grade 4 on both self-concept measures (.078 for learning and .042 for school

activities) and on self-concept related to learning in grade 6 (.040) and self-concept related to school activities in grade 5 (.043). Level of implementation of treatment was significantly related to learning self-concept in grade 4 (SMC increment of .024) and, in particular, grade 5 (SMC increment of .083). An SMC increment of .025 also was significant in grade 4 for self-concept related to school activities.

Likewise, classroom climate has some effect upon self-concept, but not as much as one intuitively might expect. Apparently by grade 4, students are able to adapt to and work in settings in which diversity, clarity, difficulty, and pace of instruction differ. It is important, however, to consider here the data reported in Appendix C, Tables C14-17. These data indicate that differences in classroom climate measures within grade levels were small, particularly when mid and high SES groups are combined, as in the analyses discussed here. Therefore, it appears that on the average, as measured by the classroom climate scale used in this study, the classes did not differ to any great extent regardless of the use or non-use of an independent learning system.

For the attitude measures, the analyses added posttest self-concept to the classroom climate cluster because it was felt that students' self-concepts were an integral aspect of the classroom climate and thus might be related to attitudes. Two important findings were obtained from these attitude measures.

First, few changes in attitude occurred between the fall and spring measurements. When changes were observed, they were more often in a positive direction at grade 4 and in a negative direction at grade 5 and especially grade 6.

Second, the classroom climate/self-concept cluster was a useful predictor of student attitudes, whereas the level of implementation cluster showed little relationship to students' attitudes. For all attitude measures, the classroom climate cluster contributed a significant increase in the amount of variance predicted at all three grade levels. The increments in SMC ranged from a high of .220 in grade 4 for attitude toward social studies to a low of .048 in grade 5 for attitude toward the teacher. In nine out of twelve instances across the grade levels, the cluster added 10 percent or more to the predicted variance in attitude scores. On the other hand, the highest increment in SMC related to the implementation cluster was .052 at grade 5 for attitude toward social studies. In all other instances, the increments were .027 or below. (It is important to remember in looking at the grade 5 result that this grade level had the fewest high implementation classes which, in turn, may have affected the outcomes in both statistical and practical terms.)

Relative to these findings, it should be noted that while there were the fewest instances of a positive change in attitudes at the sixth grade level, those that did occur were all greater than one point and were all observed in classrooms at the middle level of implementation. This suggests that the classroom climate which resulted in positive changes in sixth grade student attitudes may have been partly conditioned by the fact that in the middle level of implementation, only the six target students engaged in independent learning. These students, thus, may have received sufficient extra attention from the teacher and others to affect their attitudes toward school, etc.

The outcomes for the affective measures suggest that students' concepts and attitudes are influenced more by the characteristics of the climate in

which they work than by the particular instructional system that is used and/or by the activities in which they engage. Apparently, a teacher can establish an instructional system--be it independent learning, small group, or total group instruction--in a manner that provides either a supportive or nonsupportive learning environment.

Conclusions

The results reported herein indicated that teachers can be trained to implement an innovative instructional system--in this case, an independent learning system. Further, some analyses suggest that students in middle level of implementation classes, where few (six target) students were engaged in independent learning activities had a higher quality of teacher attention and guidance than students in those classes where 50 percent, or more, of the students participated in independent learning. This, in turn, raises questions regarding the extent to which a teacher can, or should, carry out such a system with all students in a given classroom.

The results also suggest that the dynamics of such an independent learning system are complex. This is exemplified by the various interactions of student's level of independence and level of implementation of the system and student outcomes. The content of the instructional situation including the abilities of the participants, numbers of students involved in what types of activities, the climate of the setting, etc.; student motivation; and competition for resources; are among the types of variables that need to be investigated in order to determine whether to utilize such an independent learning system.

Moreover, independent learning will not be equally effective for all students. In terms of conventional achievement outcomes, students who engage

in independent learning activities can be expected to do no better or worse than students in other types of instructional systems. They can be expected to produce better products as a result of carrying out an independent project than students with little, or no, experience in independent learning would produce.

IMPLICATIONS FOR FUTURE RESEARCH

Several outcomes of this study have important implications for future research in education.

First, the study indicates that efforts which seek to investigate or implement the intent of P.L. 94-142, requiring individually planned programs for handicapped students who are mainstreamed, should attend to the students' levels of independence. The findings of this study suggest that students with a low level of independence need frequent teacher monitoring and assistance to be successful. Investigation of student outcomes in programs such as those sponsored under P.L. 94-142, therefore, should look carefully at levels of independence and the types of support given students. Similarly, we would suggest that future research into the effects on students of various forms of independent learning attend to the students' levels of independence as an antecedent variable.

Second, it is our judgment that research which uses a treatment/control comparison should inquire into the extent to which the designated treatment was actually used in each classroom, regardless of pre-study assignment to treatment/control groups. As was demonstrated in this study, failure to inquire into the existence of the treatment can seriously distort the results and even mask any effects that might have been present. More

specifically, we recommend that rather than utilizing a treatment/control approach to in-school research, levels of implementation criteria should be specified a priori and data collection should focus upon establishing which level occurs in a given setting.

Third, we recommend the use of measures that are relevant to both schooling in general and to those aspects of student growth and development that the designated treatment is specifically designed to affect. Treatment specific measures are essential to any effort to identify effects of that treatment. Measures relevant to schooling in general also are essential since the purpose of most innovations, at a minimum, is to maintain already existing learning outcomes in some areas while increasing outcomes in other areas. We often fail to recognize this presumption.

Fourth, research in education needs to give much greater consideration than has generally been the case to the total environment in which teaching and learning occurs in order to predict and interpret student outcomes. This appears to be particularly important when the inquiry is interested in affective measures and in measures of the "quality" of the learning outcomes produced by students. In this study, classroom climate was an important predictor of outcomes on several variables. Had the research investigated only teacher related behavior, the results would have been substantially less interpretable and some significant findings would have been missed. This underscores the recent comments of several researchers (e.g., Rosenshine and Furst, 1973; Bennett, 1976; McDonald, 1976) that much research on teaching has attended solely to the treatment being investigated and inadequately specified the larger classroom environment and teaching/learning events. The efforts made in the

Independent Learning Study to investigate the classroom environment need to be extended in future research, perhaps using ethnographic observation (Tikunoff, et al., 1975) as a tool of investigation.

Fifth, the findings of this study point to the need for research relative to the types of changes in schooling which may affect student outcomes at different grade levels. The results suggest differential effects on students at grade 4 versus those at grades 5 and 6. Only at grade 4 did the quasi-treatment cluster show significant effects with any consistency, whereas classroom climate and student input had greater predictive value at grades 5 and 6. These findings pose several questions for future research. Are students at grade 4 still responsive to changes in the instructional system while students in grades 5 and 6 are not? Are efforts to modify only the instructional system and organization in the fifth and sixth grades fundamentally unproductive in terms of student outcomes? Does classroom climate have higher predictive value for student outcomes in grades 5 and 6 than changes in the instructional system when treatments other than independent learning are introduced?

Investigation of such issues is clearly important to confirm, modify, or negate the results of this study which suggest that efforts to improve education for students in grade 5 and beyond need to attend to more than modifications in how schools are organized for instruction.

BIBLIOGRAPHY

- Alschuler, A. S. How to increase motivation through climate and structure. Achievement Motivation Development Project Working Paper No. 8. Cambridge: Harvard University, Graduate School of Education, 1968.
- Anderson, G. Effects of classroom social climate on individual learning. American Educational Research Journal, 1970, 7, 135-152.
- Ausubel, D. P. Motivational actions in learning. In D. P. Ausubel (Ed.), Educational psychology: A cognitive view. New York: Holt, Rinehart, & Winston, 1968.
- Barth, R. S. Open education and the American school. New York: Agathon Press, 1972.
- Beaton, A. E. "Commonality." Princeton, N.J.: Educational Testing Service, 1973. (Mimeographed.)
- Beggs, D. W., III, & Buffie, E. G. (Eds.). Independent study: Bold new venture. Bloomington: Indiana University Press, 1965.
- Bennett, N. Teaching style and pupil progress. Cambridge: Harvard University Press, 1976.
- Bloom, B. S. Learning for mastery. UCLA Evaluation Comment, May, 1968.
- Borg, W. R., Kelley, M. L., Langer, P., & Gall, M.D. The Minicourse: A microteaching approach to teacher education. New York: Macmillan Educational Services, 1970.
- Brophy, J. E. Reflections on research in elementary schools. Paper presented at the Conference on Research on Teacher Effects, Austin, Texas, 1975.
- Bussis, A., & Chittenden, E. Analysis of an approach to open education. Princeton: Educational Testing Service, 1970.
- Carroll, J. A. A model for school learning. Teachers College Record, 1963, 64, 723-733.
- Dell, H. D. Individualizing instruction: Materials and classroom procedures. Palo Alto: Science Research Associates, 1972.
- Fisher, C. Educational environments in elementary schools differing in architecture and program openness. Unpublished doctoral dissertation, University of Toronto, 1973.
- Gall, M. D., Ward, B. A., Berliner, D.C., Cahen, L.S., Crown, K.A., Elashoff, J. D., Stanton, G. S., & Winne, P. The Effects of Teacher Use of Questioning Techniques on Student Achievement and Attitudes. Vol I. Final Report. San Francisco: Far West Laboratory for Educational Research and Development, 1976.

- Gardner, D. E. M. Does progressive primary education work? London: Association for Childhood Education International, 1967.
- Gibbons, M. What is individualized instruction? Interchange, 1970, 1(2), 28-52.
- Guilford, J. P. Psychometric methods, 2nd. ed. New York: McGraw-Hill, 1954.
- Guttman, L. The basis for scalogram analysis. In S. A. Stouffer et al. Studies in Social Psychology in World War II. Vol. IV. Measurement and Prediction. Princeton, N.J.: Princeton University Press, 1950.
- Hall, G. E., Loucks, S. F., Rutherford, W. L., & Newlove, B. W. Levels of use of the innovation: A framework for analyzing innovation adoption. The Journal of Teacher Education, 1975, 26, (1), 52-56.
- Heimgartner, N. A comparative study of self-concept: Open space. Greeley: University of Northern Colorado, 1972.
- Hofmeister, A. M., & Stowitschek, L. L. Effects of minicourse instruction on teachers and pupils. Exceptional Children, 1974, 40, 490-95.
- Instructional Objectives Exchange. Attitude toward school: Grades K-12. Rev. Ed. Los Angeles: Instructional Objectives Exchange, 1972.
- Johnson, S. M., & Martin, S. Self-evaluation as conditioned reinforcement. (mimeographed). Eugene: University of Oregon, undated.
- Kahn, S. B., & Weiss, J. The teaching of affective responses. In R. M. W. Travers (Ed.), Second handbook of research on teaching. Chicago: Rand McNally, 1973.
- Kerlinger, F., & Pedhazur, E. Multiple regression in behavioral research. New York: Holt, Rinehart and Winston, 1973.
- Klausmeier, H. J., Morrow, R. G., & Walter, J. E. The multi-unit organization and elementary education in the decades ahead. Educational Specifications for a Comprehensive Elementary Teacher Education Program. Toledo: University of Toledo, 1968.
- Lai, M. K., Mills, S. R., et al. Teacher training phase of the independent learning study. San Francisco: Far West Laboratory for Educational Research and Development, 1974.
- Liddle, G. P., Rockwell, R. E., & Sacadat, E. Education improvement for the disadvantaged in an elementary setting. Springfield, Ill.: Charles C. Thomas, 1967.

- MacDonald, J. B. The open school: Curriculum concepts. In B. Spodek (Ed.), Open education. Washington, D.C.: National Association for the Education of Young Children, 1970.
- Maher, L., & Sjogren, D. Atkinson's theory of achievement motivation: First step toward a theory of academic motivation. Review of Educational Research, 1971, 41, 143-161.
- Mayeske, G. W., Okada, T., Beaton, A. E., Cohen, W. M., & Wisler, C. E. A study of the achievement of our nation's schools. Washington, D.C.: U. S. Government Printing Office, 1973.
- McDonald, F. J. Beginning Teacher Evaluation Study, Phase II summary. Washington: National Institute of Education, 1976.
- McNeil, J.D., & Popham, W. J. The assessment of teacher competence. In Travers, R. M. W. (Ed.), Second handbook of research on teaching. Chicago: Rand McNally, 1973.
- Nelson, R. G. An analysis of the relationships of the multiunit school organizational structure and individually guided education to the learning climate of pupils. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, March 1973.
- Niedermeyer, F., & Klein, S. P. An empirical evaluation of a district's teacher accountability system. Phi Delta Kappan, 1972, 54(2), 100-103.
- Nomos Institute. Report to Far West Laboratory, Contract NE-C-00-3-0108. Berkeley: Nomos Institute, February, 1975.
- _____. Description of Pilot Test of Pupil-Product Evaluation. Berkeley: Nomos Institute, February, 1975.
- _____. Procedures for Evaluation of Pupil-Products in Independent Learning Study. Berkeley: Nomos Institute, March, 1975.
- Nyquist, E., & Hawes, G. Open education: A sourcebook for parents and teachers. New York: Bantam, 1972.
- Rogers, C. R. Freedom to learn. Columbus, Ohio: Charles E. Merrill, 1969.
- Rosenshine, B. Classroom instruction. In N. L. Gage (Ed.), The psychology of teaching methods. Seventy-seventh yearbook, National Society for the Study of Education. Chicago: University of Chicago Press, 1976.
- _____. Teaching behaviors and student achievement. London: National Foundation for Educational Research in England and Wales, 1971.
- Rosenshine, B., & Furst, N. The use of direct observation to study teaching. In R. M. W. Travers (Ed.), Second handbook of research on teaching. Chicago: Rand McNally, 1973.

- Scanlon, R. G. Factors associated with a program for encouraging self-initiated activities by fifth and sixth grade students in a selected elementary school emphasizing individualized instruction. University of Pittsburgh, School of Education, ED 015 785, 1966.
- Siegel, S. Nonparametric statistics. New York: McGraw-Hill, 1956.
- Skinner, B. F. The technology of teaching. New York: Meredith, 1968.
- Soar, R. S. Whither research on teacher behaviour? Classroom Interaction Newsletter, 1967, 3, 9-11.
- _____. Teacher behaviour related to pupil growth. International Review of Education, 1973, 18, 508-525.
- Stallings, J. A., & Kascovitz, D. H. Follow through classroom observation evaluation (1972-1973). Menlo Park, Ca.: Stanford Research Institute, 1974.
- Strickler, D. J. Teacher behavior and pupil performance related to a training program for inservice and preservice teachers based upon Minicourse 18, Teaching Reading as Decoding. Unpublished doctoral dissertation, The State University of New York at Buffalo, 1972.
- Sullivan, H. J. Objectives, evaluation and improved learner achievement. Instructional Objectives. Monograph No. 3, American Educational Research Association. Chicago: Rand-McNally, 1969.
- Tikunoff, W. J., Berliner, D. C., & Rist, R. C. Special Study A: An ethnographic study of the forty classrooms of the known sample of the Beginning Teacher Evaluation Study. San Francisco: Far West Laboratory for Educational Research and Development, 1975. Technical Report #75-10-5-(A).
- Traub, R. E., Weiss, J., Fisher, C. W., & Musella, D. Closure on openness in education. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, 1973.
- Traub, R., Weiss, J., Fisher, C. W., Musella, D., & Khan, S. Educational evaluation instruments: A resource booklet of selected data-gathering procedures for use in school evaluation studies. Ontario: Educational Evaluation Center, The Ontario Institute for Studies in Education, 1973.
- Tuchman, B., Cochran, D., & Travers, J. Evaluating the open classroom. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, March 1973.
- Walberg, H. J., & Anderson, G. Classroom climate and individual learning. Journal of Educational Psychology, 1968, 59, 414-419.
- Ward, B. A. Independent mathematics learning as a function of teacher behavior. Unpublished doctoral dissertation, University of California, Berkeley, 1971.

Ward, B. A. Minicourse 15: Organizing independent learning: Intermediate level. New York: Macmillan, 1973.

Williams, B. I., Ward, B. A., Berliner, D. C., & Cahen, L. S. Math tutoring, Study I: Teachers as tutors. San Francisco: Far West Laboratory for Educational Research and Development, 1976.

Williams, B. I., Banks, H. A., Ward, B. A., Berliner, D. C., & Cahen, L. S. Math tutoring study, Study II: Paraprofessionals as tutors. San Francisco: Far West Laboratory for Educational Research and Development, 1977.

Winer, B. J. Statistical principles in experimental design, Second edition. New York: McGraw-Hill, 1962.

APPENDIX A

Content of Minicourse 15

Minicourse 15 contains five instructional lessons, each dealing with two or more critical behaviors. The instructional lessons are organized into three major sections as follows:

Section One - Preparing to Introduce Independent Learning. Instructional Lesson 1 focuses upon assessing student readiness for independent learning. When independent study is introduced, it is essential that students have a clear understanding of what it means to work independently and that the teacher have information about each student's ability to plan and carry out independent projects. The first lesson, therefore, develops teacher skills in assessing students' understanding of the concept of independent learning and in assessing their levels of independence. Because students vary in their ability to function in independent study situations, it is important that a student's level of independence be properly assessed by the teacher. Based on an adaptation of a hierarchy suggested by Patrick (1965), three levels of independence have been identified: 1) Guided study--the teacher decides what the student is to learn and determines the tasks to be included in the independent project. Monitoring and feedback are frequent. 2) Cooperative planning--the teacher and students cooperatively plan, refining the student's ideas. The student receives occasional feedback regarding his progress. 3) Individual pursuit--the student can state his/her own learning objectives and identify tasks (s)he will undertake to achieve these objectives. The project is carried out with a minimal amount of teacher guidance.

Section Two - Developing Independent Learning Contracts. The second major section of the course begins with an overview of the Independent Learning Contract. A learning contract is an agreement between the teacher

and a student that states what the student will learn and how (s)he will go about acquiring the specified skills and knowledge. It serves as a monitoring tool for the teacher and a learning guide for the student. Independent learning contracts contains seven essential elements which correspond to the seven teacher behaviors taught in Section Two.

1. Specification of what is to be learned. A well-stated objective is a guide for planning (Sullivan, 1969). It clarifies for both teacher and student what is to be learned and thus helps focus the student's efforts on the most relevant activities. An explicit statement of learning objectives can also increase a student's deliberate intent to learn (Ausubel, 1968). The teacher behavior related to this first element of a learning contract is exhibited whenever the specific skill or knowledge to be mastered by the student is stated and made known to the pupil.
2. Specification of how the student will demonstrate that (s)he has learned the skills and knowledge. Specifying how learning will be demonstrated further focuses the student's efforts. Because the student understands how (s)he will be evaluated, (s)he has a basis for judging his/her progress. The procedure of evaluating against a specified level of performance instead of using comparisons with other students have been found to be preferable in producing intrinsic motivation for learning (Bloom, 1968). The related teacher behavior occurs whenever a criterion of performance or a finished product (a display, report or other visible evidence of learning) is established and made known to the student.

3. Identification of the resources. Ward (1973) presented three reasons why this contracting step is important: a) The very process of identifying resources stimulates teacher and student to think of a wider variety of teaching tools than they might otherwise have considered; b) The student does not experience uncertainty about sources of information during his/her independent work; c) A listing of resources helps a teacher plan with a student a means of accomplishing his/her objective in a manner that is appropriate to his/her learning style. Direction of the pupil to the use of such items as audio-visual materials, resource people, programmed instruction, library books, textbooks, work-books, and experimental kits constitutes the use of this behavior.
4. Specification of the major steps or tasks. The listing of major steps in a contract divides the total task into more manageable units. Students can sometimes become more confident and purposeful when dealing with specific learning steps instead of an entire task (Ausubel, 1968; Maher and Sjogren, 1971). For the teacher, checking off the learning steps as they are completed provides a means of helping keep track of progress. A learning step is specified whenever a task is named that a student must complete in order to master a particular skill and/or knowledge.
5. Establishment of checkpoints for determining progress. Checkpoints help a student pace learning (Bloom, 1968). When a student is assured that (s)he is making progress on the learning task, (s)he becomes motivated for continued learning (Bloom, 1968; Skinner, 1971). This behavior occurs whenever a time is established

for the pupil to receive information or feedback about his/her performance.

6. Establishment of deadlines. Deadlines discipline the student's independent work and help the teacher to monitor progress. Failure to meet deadlines can alert the teacher to the possibility the the student needs assistance in planning, pacing, or executing his/her work. Deadlines in a contract are also seen as a way of matching time to be spent in achieving specific objectives to the capacities of the individual student. Carroll (1963) and Bloom (1968) both emphasized that appropriate adjustment of the amount of time allotted for mastering a learning task is essential to good teaching. This behavior occurs whenever a pupil is committed to a date for completing the product(s) or achieving the criteria of performance that are used to demonstrate learning.
7. Identification of activity. Specifying an activity that the student may engage in when the contract is finished can motivate the completion of the contract (Johnson and Martin, undated). In addition, this final step helps to reduce a teacher's management problems because the student can continue productive activity without need for teacher intervention. This behavior is exhibited whenever a teacher and pupil agree on a pupil selected activity that is not directly related to demonstrating achievement, but is an activity in which the student may engage after demonstrating learning.

Instruction Lessons II, III, and IV provide detailed information about these seven teaching behaviors.

Section Three - Introducing Independent Learning. Minicourse 15 concludes with Instructional Lesson V which presents four teaching skills that help the teacher to make independent learning an integral part of the instructional program. The skills are: 1) Determining procedures to be followed in operating an independent learning program; 2) Introducing students to the independent learning contract; 3) Developing student skill in solving problems that occur when working independently; and 4) Building student expertise in the use of learning skills that apply to a wide variety of independent learning situations. During this final section of the course, the teacher develops an individual plan for introducing independent learning into his or her own classroom.

APPENDIX B

Student Attrition by Class for Treatment
Socioeconomic Status and Grade

APPENDIX B

Student Attrition by Class for
Low, Mid, and High SES Control Classrooms

School	Grade	Teacher	Original N	No. Moved	No. Dropped	Final N
<u>Low SES</u>						
01	4	01	3	0	2	1
01	5	01	9	2	0	7
01	5	02	3	0	0	3
01	6	02	9	0	1	8
<u>Mid SES</u>						
05	4	18	12	0	1	11
05	4	23	12	0	0	12
06	4	24	8	0	0	8
06	4	25	9	0	0	9
06	4	28	8	1	1	6
05	5	20	12	1	1	10
05	5	21	12	0	0	12
05	5	22	12	0	0	12
06	5	26	11	0	0	11
06	5	27	12	0	0	12
05	6	19	12	0	0	12
06	6	26	1	0	1	0
<u>High SES</u>						
04	4	13	12	0	0	12
09	4	40	12	0	0	12
09	4	42	12	[Teacher Dropped]		0
16	4	75	12	1	1	10
16	4	78	12	0	1	11
17	4	80	12	[School Dropped]		0
17	4	84	12	[School Dropped]		0
18	4	88	12	0	0	12
04	5	16	12	1	0	11
09	5	41	12	0	0	12
09	5	45	12	0	0	12
16	5	77	12	0	1	11
17	5	85	12	[School Dropped]		0
18	5	90	12	0	0	12
18	5	91	12	0	0	12
04	6	14	11	0	0	11
04	6	15	12	0	1	11
09	6	43	12	0	1	11
09	6	44	12	0	0	12
16	6	76	12	0	0	12
17	6	81	12	[School Dropped]		0
17	6	82	12	"	"	0
17	6	83	12	"	"	0
18	6	87	12	0	0	12
18	6	89	12	0	0	12

APPENDIX B

Student Attrition by Class for
Low, Mid, and High SES Treatment Classrooms

School	Grade	Teacher	Original N	No. Moved	No. Dropped	Final N
<u>Low SES</u>						
02	4	05	1	0	1	0
02	4	07	6	1	0	5
02	5	05	5	2	0	3
02	5	04	1	0	0	1
02	5	06	2	0	0	2
02	5	07	3	0	0	3
02	6	05	6	1	2	3
02	6	04	11	1	0	10
02	6	06	10	2	0	8
02	6	07	3	0	0	3
<u>Mid SES</u>						
07	4	33	12	0	0	12
07	4	34	12	1	0	11
08	4	36	12	[Teacher Dropped]		0
08	4	37	12	3	1	8
14	4	65	12	0	0	12
07	5	30	8	0	0	8
07	5	32	3	0	3	0
08	5	38	12	0	0	12
07	6	30	4	1	3	0
07	6	32	9	0	0	9
07	6	31	12	1	0	11
14	6	66	12	1	1	10
14	6	67	12	0	0	12
<u>High SES</u>						
10	4	47	12	1	0	11
11	4	51	12	2	0	10
13	4	63	12	0	0	12
15	4	72	12	0	0	12
11	5	50	12	2	0	10
13	5	60	12	0	0	12
13	5	62	12	0	0	12
15	5	71	12	0	0	12
10	6	48	12	2	0	10
11	6	53	12	0	1	11
11	6	54	12	0	0	12
13	6	61	12	0	0	12
15	6	73	12	1	2	9

APPENDIX C

Descriptive Statistics for Student Measures
by Treatment, Socioeconomic Status, and Grade

244

TABLE C-1
Social Studies Achievement

		Treatment						Control					
		Pre			Post			Pre			Post		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	6.6	3.7	43	8.5	3.4	43	7.1	3.2	44	7.7	3.1	46
	5th grade	8.1	3.0	20	9.7	3.3	20	7.3	3.3	56	8.7	3.2	56
	6th grade	10.1	3.1	42	10.8	3.1	42	8.4	3.3	12	9.3	2.5	12
High SES	4th grade	8.1	3.1	45	9.5	2.9	45	8.7	3.4	57	11.3	2.8	56
	5th grade	11.8	2.7	46	12.7	2.8	46	11.3	2.6	70	11.8	3.1	70
	6th grade	12.1	3.4	54	12.8	3.1	54	11.8	2.7	81	13.1	2.5	81

TABLE C-2
Work Study Skills

		Treatment						Control					
		Pre			Post			Pre			Post		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	8.4	3.6	39	12.7	4.5	43	9.1	3.2	46	11.0	3.8	45
	5th grade	11.9	5.3	20	14.3	5.1	20	10.3	3.4	57	11.5	4.5	57
	6th grade	13.3	4.8	42	16.7	5.2	41	10.6	4.4	12	14.0	4.3	12
High SES	4th grade	10.6	4.1	45	13.5	5.0	44	12.3	4.7	57	17.4	4.8	57
	5th grade	16.7	4.5	46	19.9	5.1	46	15.9	4.9	69	18.3	4.5	70
	6th grade	18.2	6.6	54	20.9	5.8	53	17.9	5.4	81	19.7	5.2	80

TABLE C-3
Self-Concept Questionnaire

		Treatment						Control					
		Pre			Post			Pre			Post		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	64.6	14.0	43	68.1	16.0	43	68.0	13.1	46	65.7	12.7	46
	5th grade	69.3	15.9	20	67.0	15.4	20	64.8	16.3	57	62.7	16.3	57
	6th grade	64.5	14.1	42	63.3	12.6	42	63.7	16.1	12	64.8	11.2	12
High SES	4th grade	71.6	10.4	45	74.1	13.1	45	72.4	13.2	57	71.7	13.7	57
	5th grade	67.0	13.8	46	68.1	12.1	46	73.7	14.0	70	69.9	13.5	69
	6th grade	67.8	13.5	54	67.9	13.8	54	69.9	14.0	81	65.3	15.1	81

TABLE C-4
Attitude Toward Schooling

		Treatment						Control					
		Pre			Post			Pre			Post		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	37.1	6.5	42	37.3	7.0	43	37.5	5.9	46	37.2	6.0	46
	5th grade	37.2	7.2	20	38.3	6.3	20	36.7	6.2	57	35.8	8.0	57
	6th grade	33.0	8.6	42	30.3	9.4	42	35.1	5.4	11	37.0	2.6	12
High SES	4th grade	30.3	10.7	45	29.3	11.2	45	31.9	10.6	56	32.4	10.8	56
	5th grade	32.3	9.2	46	32.6	9.1	46	32.4	8.1	70	31.2	8.6	70
	6th grade	30.5	9.4	54	32.1	7.3	54	34.5	7.7	81	30.0	8.0	81

TABLE C-5
Attitude Toward Teacher

		Treatment						Control					
		Pre			Post			Pre			Post		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	34.1	4.2	42	34.8	4.2	43	31.3	4.9	46	33.4	6.8	46
	5th grade	33.0	4.1	20	34.7	4.1	20	32.6	6.2	57	32.1	6.5	57
	6th grade	32.5	6.0	42	29.3	5.7	42	31.2	4.2	11	35.3	3.6	12
High SES	4th grade	31.2	7.9	45	30.1	8.1	45	35.1	4.0	57	33.7	6.3	57
	5th grade	34.2	4.5	46	32.5	5.4	46	34.6	4.9	70	32.4	5.9	70
	6th grade	34.1	4.4	54	31.4	5.9	54	34.5	4.7	81	31.7	6.6	81

TABLE C-6
Attitude Toward Learning

		Treatment						Control					
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	27.7	4.0	42	28.4	3.1	43	28.0	4.3	46	28.6	4.0	46
	5th grade	27.6	4.6	20	28.6	4.1	20	27.6	4.8	57	28.3	4.4	57
	6th grade	27.7	4.3	42	25.7	3.8	42	28.8	4.0	11	29.4	3.4	12
High SES	4th grade	27.5	4.7	45	27.2	5.0	45	28.0	4.7	56	27.3	5.1	57
	5th grade	27.6	4.1	46	27.9	3.9	46	28.0	4.3	70	26.9	4.6	70
	6th grade	26.9	4.3	54	27.2	3.1	54	28.1	3.9	81	26.6	4.4	81

TABLE C-7
Attitude Toward Social Studies

		Treatment						Control					
		Pre			Post			Pre			Post		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	28.2	4.9	42	27.6	4.8	43	30.4	4.4	46	29.8	4.7	46
	5th grade	29.3	4.1	20	28.2	6.5	20	29.4	5.1	57	29.6	5.8	57
	6th grade	25.9	5.1	42	23.3	5.6	42	28.7	3.9	11	29.6	4.0	12
High SES	4th grade	28.0	5.9	45	30.1	6.9	45	27.9	5.5	57	30.0	6.4	57
	5th grade	27.5	4.5	46	28.5	5.0	46	27.8	5.1	70	26.1	6.2	70
	6th grade	25.6	6.4	54	27.0	5.1	54	28.0	5.5	81	26.8	6.1	81

TABLE C-8
Self-Concept Scale

		Treatment						Control					
		Pre			Post			Pre			Post		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	56.3	7.5	42	57.1	9.0	43	56.2	6.4	46	68.0	7.5	46
	5th grade	56.6	7.7	20	59.2	7.5	20	55.0	5.9	57	55.8	6.9	57
	6th grade	56.6	9.2	42	56.2	7.3	42	54.5	6.9	11	56.6	5.3	12
High SES	4th grade	62.7	7.4	45	63.5	8.1	45	61.4	8.2	56	59.2	10.7	57
	5th grade	58.5	7.3	46	60.0	9.2	46	61.1	8.1	70	60.2	8.2	70
	6th grade	59.4	8.3	54	58.8	7.6	54	60.1	8.1	81	59.4	6.8	81

TABLE C-9
Level of Independence

		Treatment						Control					
		Pre			Post			Pre			Post		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	7.4	2.1	43	8.6	1.5	43	6.8	1.8	29	8.3	1.4	46
	5th grade	7.5	2.0	20	9.4	1.9	20	7.4	1.9	57	7.4	1.5	56
	6th grade	8.0	2.1	42	9.2	1.6	42	8.0	1.7	6	8.8	2.1	12
High SES	4th grade	7.6	1.8	45	9.2	1.3	45	7.8	2.0	57	9.1	1.1	57
	5th grade	7.9	1.8	46	9.7	1.4	46	8.1	1.8	70	9.4	1.4	70
	6th grade	8.3	1.9	54	10.1	1.3	54	8.3	1.8	81	9.7	1.3	81

TABLE C-10
Product Evaluation - Global Quality

		Treatment			Control		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	52.6	5.4	10	53.2	1.7	7
	5th grade	41.2	9.5	3	43.9	13.9	7
	6th grade	51.2	2.9	11	-	-	-
High SES	4th grade	50.1	2.5	10	48.2	4.5	7
	5th grade	52.1	3.4	6	52.2	0.9	5
	6th grade	54.5	4.1	7	51.6	3.5	9

TABLE D-11
Product Evaluation - Cognitive Quality

		Treatment			Control		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	48.4	2.8	10	52.3	2.6	7
	5th grade	45.0	5.5	3	46.3	5.7	7
	6th grade	47.8	2.3	11	-	-	-
High SES	4th grade	49.6	2.5	10	49.6	4.2	7
	5th grade	52.8	3.3	6	52.5	2.0	5
	6th grade	55.4	4.1	7	51.3	4.5	9

TABLE C-12
Product Evaluation - Creative Quality

		Treatment			Control		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	53.0	4.9	10	50.6	2.9	7
	5th grade	43.9	4.6	3	47.2	5.2	7
	6th grade	53.0	2.9	11	-	-	-
High SES	4th grade	51.1	3.1	10	48.6	5.5	7
	5th grade	51.7	6.0	6	51.5	2.8	5
	6th grade	53.0	3.8	7	49.1	3.3	9

TABLE D-13
Verbal Ability

		Treatment			Control		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	9.7	6.2	42	9.1	3.2	46
	5th grade	16.6	8.3	20	13.3	6.9	55
	6th grade	20.3	9.0	42	18.6	9.7	12
High SES	4th grade	15.6	7.9	45	16.9	7.9	55
	5th grade	23.1	8.6	46	21.9	8.0	69
	6th grade	28.6	7.7	53	26.9	8.1	80

TABLE C-14
Social Climate Diversity

		Treatment			Control		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	26.6	3.1	43	24.7	4.5	46
	5th grade	23.7	3.3	20	25.2	3.0	57
	6th grade	25.4	4.1	42	26.3	2.8	12
High SES	4th grade	26.3	4.3	45	28.7	4.6	57
	5th grade	23.9	4.4	45	23.1	5.4	70
	6th grade	27.6	4.2	54	25.0	4.4	81

TABLE D-15
Social Climate Clarity

		Treatment			Control		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	26.7	3.3	43	27.5	3.3	46
	5th grade	27.8	2.8	20	27.8	3.2	57
	6th grade	27.3	2.8	41	28.6	2.7	12
High SES	4th grade	29.2	3.2	45	29.3	3.9	57
	5th grade	29.0	3.9	45	28.3	3.4	70
	6th grade	29.4	3.7	54	28.5	3.7	81

TABLE C-16
Social Climate Simplicity

		Treatment			Control		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	23.1	3.6	43	21.9	3.8	46
	5th grade	22.1	3.1	20	22.2	2.7	57
	6th grade	22.2	3.5	41	20.3	1.6	12
High SES	4th grade	20.0	3.7	45	19.9	3.9	57
	5th grade	20.8	2.5	45	20.3	3.8	70
	6th grade	20.6	2.7	54	20.6	3.8	81

TABLE D-17
Social Climate Pace

		Treatment			Control		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Mid SES	4th grade	24.9	2.5	43	23.7	3.5	46
	5th grade	25.4	3.7	20	24.8	3.2	57
	6th grade	24.0	2.2	41	23.5	2.2	12
High SES	4th grade	25.1	3.2	45	24.7	4.0	57
	5th grade	22.4	3.4	45	23.3	3.8	70
	6th grade	25.9	3.2	54	23.7	4.0	81

APPENDIX D

Factor Analysis of Student Attitude Questionnaire

ATTITUDE TOWARD SCHOOLING SCALE

Items	Factor Loading on the First Ten Factors									
	1	2	3	4	5	6	7	8	9	10
3. Each morning I look forward to coming to school.	.680	.060	.069	.194	.121	.009	.070	.078	.052	-.016
10. I find it hard to stay happy at school because I wish I could be somewhere else.	-.720	.047	-.083	-.032	.085	.059	.084	.155	-.018	.135
17. Most school days seem like they will never end.	-.657	-.048	-.119	-.137	.108	.002	.076	.183	.065	.069
24. I don't like having to go to school.	-.750	-.040	-.108	-.107	.034	-.017	.044	.255	.015	.058
31. I wish I didn't have to go to school.	-.857	.009	-.128	-.031	-.023	-.025	.082	.108	.092	.054
37. I feel good when I'm at school because it's fun.	.797	.071	.166	.147	.168	.088	.039	-.033	.042	.027
43. I do not like to stay home from school.	.621	.146	.141	.050	.143	.040	.075	-.053	.162	.136
48. I like school because there are so many interesting things to do.	.712	-.001	.080	.196	.185	.069	.047	.056	-.114	.107
55. It would be nice if I never had to come back to school again after today.	-.808	.027	-.104	-.112	.005	-.022	.134	.124	.099	.128
60. I'm very happy when I'm at school.	.797	.029	.115	.110	.114	.151	.059	-.037	.002	.086
65. School is exciting.	.73	.060	.061	.196	.136	.150	-.006	-.007	.045	-.033
68. I don't like school because it's too much work.	-.683	.000	-.143	-.198	.050	-.021	.073	.120	.140	.221

D-2

ATTITUDE TOWARD TEACHER SCALE

Items	Factor Loading on the First Ten Factors									
	1	2	3	4	5	6	7	8	9	10
1. My teacher is interested in the things I do outside of school.	.154	.064	.316	-.011	.107	-.085	.098	-.021	.190	.014
7. My teacher listens to what I have to say.	.105	-.036	.605	.115	.034	.089	.152	-.092	.058	-.158
14. My teacher does not care about me.	-.267	.042	-.554	.166	-.141	.071	.122	.058	.297	.220
21. My teacher doesn't understand me.	-.361	.014	-.504	.071	-.186	-.048	.138	.171	.237	.104
28. My teacher tries to do things that the class enjoys.	.222	.087	.405	.162	.008	-.035	-.075	.115	-.003	-.054
34. My teacher is not very friendly with the children.	-.198	-.110	-.615	.108	-.005	.134	.268	.110	-.014	.038
41. My teacher likes some children better than others.	-.080	.046	-.480	-.078	.262	.023	.070	.275	.190	-.227
46. I like my teacher because he/she is understanding when things go wrong.	.179	-.025	.740	.085	.125	.116	.104	-.019	.023	.008
52. If I had a problem outside of school, I could go to my teacher for help.	.029	-.053	.061	.031	-.005	.168	.069	.040	.031	-.037
58. My teacher cares about the feelings of the pupils in his/her class.	.210	.010	.703	-.020	.035	.142	-.006	-.054	-.005	.032
63. My teacher doesn't care what happens to me outside of school.	-.091	.055	-.534	.013	.007	-.016	.145	.083	.051	-.021

ATTITUDE TOWARD LEARNING SCALE

Items	Factor Loading on the First Ten Factors									
	1	2	3	4	5	6	7	8	9	10
2. I like to do my homework.	.642	.066	.051	.179	.032	.103	.098	.037	-.026	.129
9. Everything I learn in school is dull.	-.484	.157	-.142	-.069	.096	.071	.129	.264	-.095	.221
16. I feel happy if I learn something new in school each day.	.415	.046	.093	.088	.423	-.055	.173	-.039	-.170	.024
23. Learning new things is really fun.	.480	-.005	.061	.131	.289	.084	.116	.042	-.085	-.084
30. When my school work is hard, I don't feel like doing it.	-.512	-.055	.052	-.193	-.026	-.192	.101	.249	.329	-.055
36. I do a lot of reading outside of school.	.204	.262	.080	.181	-.011	.028	-.004	-.061	-.433	.201
42. The biggest reason for coming to school is to learn.	.191	-.020	.087	.034	.149	.003	-.038	-.047	.090	-.023
47. I don't care how well I do on my school work.	-.124	-.029	-.117	.052	-.071	.021	.291	.336	.177	.233
54. I would rather do almost anything else than study.	-.658	-.016	-.010	-.190	-.036	-.022	.134	.124	.099	.128

014

ATTITUDE TOWARD SOCIAL STUDIES SCALE

Items	Factor Loading on the First Ten Factors									
	1	2	3	4	5	6	7	8	9	10
6. I look forward to coming to social studies class.	.262	.076	-.061	.729	.043	-.020	.116	-.052	-.055	-.002
13. Pupils say that social studies class is fun.	.316	.030	.020	.609	-.061	.044	.124	.092	.194	-.073
20. I feel that I get things done in social studies class.	.180	.030	-.016	.528	.264	.173	.248	-.274	-.144	.021
27. When I finish my social studies assignments, I feel that I've accomplished something.	.020	.724	-.067	.054	.083	.056	.081	-.086	.132	.069
33. If I could choose what I wanted to do, social studies is the last thing I would pick.	-.292	.041	.032	-.718	-.038	.129	.186	.009	.062	.098
40. Even when social studies work is hard, I like to try it.	.335	.053	-.014	.526	.310	.185	-.041	-.022	-.067	.145
45. I would like to spend more time in social studies class.	.208	.017	.026	.774	.114	.026	.086	.056	-.048	-.011
51. In social studies class, time seems to pass very quickly.	.136	.057	.029	.721	.002	.030	-.119	.035	.123	.131
57. Pupils work hard in social studies class, but it's worth it.	.424	-.075	.106	.479	.146	.073	-.006	-.014	-.168	.109
62. When I complete social studies work correctly, I really feel good.	.098	.013	.167	.179	.718	.064	-.073	-.134	.040	-.013

D-5

SELF CONCEPT SCALE

Items	Factor Loading on the First Ten Factors									
	1	2	3	4	5	6	7	8	9	10
5. I have trouble learning.	-.128	-.451	.026	.084	.043	-.004	.173	.402	.338	.109
8. When school work is hard, I give up.	-.139	-.181	-.095	.048	-.242	.119	.358	.536	.130	-.077
12. I solve problems easily.	.063	.544	.031	-.004	-.133	.127	.074	-.281	-.082	.179
15. I do my school work without being told more than once.	.194	.090	.048	.039	-.238	.167	.047	-.499	.017	.133
19. Most kids are smarter than I am.	.017	-.698	-.001	-.052	-.012	-.019	.199	.299	.082	.134
22. I often forget what the teacher tells us to do next.	-.101	-.125	-.022	.027	-.145	.120	-.083	.707	-.082	.228
26. I often know the answer before the rest of the class.	.020	.724	-.067	.054	.083	.056	.081	-.086	.131	.069
29. I get my work done on time.	.085	.296	.080	.072	.062	.126	.086	-.529	.149	.013
35. I often give up because I don't understand something.	-.179	-.126	-.073	.010	-.136	-.013	.228	.612	.143	-.018
39. I get good grades easily.	.054	.679	-.016	.058	.028	.151	.174	-.160	.017	-.111
44. I find it easy to get along with my classmates.	.156	.154	.074	.014	.056	.720	-.020	-.034	.048	-.078
50. I like the kids in this class very much.	.195	-.114	.073	.069	.168	.705	.002	-.112	.040	.051
53. I find it hard to remember things.	-.124	-.211	-.107	.031	-.010	-.108	.026	.579	.100	.289
56. I am an important person to my classmates.	-.007	.451	.052	.020	.052	.492	.035	.084	.015	-.069
59. I do not do well on tests.	-.036	-.510	-.102	-.009	-.071	-.178	.102	.381	.147	.194
61. My classmates like me.	.039	.272	-.014	.004	-.117	.697	.052	-.047	.007	-.079
64. I find it hard to talk to classmates.	-.094	-.136	-.060	.046	.080	-.087	.012	.195	.044	.700
66. I feel good about my school work.	.449	.127	.208	.178	.122	.304	.143	-.200	-.047	.193
67. I feel left out of things in class.	-.228	-.208	-.264	-.077	.000	-.272	.175	.180	.364	.284
69. Often I don't understand what is going on in class.	-.118	-.159	.001	-.086	-.074	-.191	.113	.551	.279	.188

INDEPENDENCE SCALE

Items	Factor Loading on the First Ten Factors									
	1	2	3	4	5	6	7	8	9	10
4. When it comes to school work, I do what other kids tell me.	-.063	.072	-.064	.039	.008	.019	.756	.167	.071	.059
11. The teacher often has to remind me about my assignments.	-.098	-.142	-.169	.002	.031	-.069	.202	.663	.086	-.023
18. I try to do my school work by myself.	.090	.214	.117	.065	.104	.058	-.383	-.098	.050	-.041
25. I depend on other people most of the time.	-.088	.062	-.094	.008	.091	.308	.038	.239	.609	.160
32. I stand up for my rights even when others don't.	.003	.172	.027	.009	.035	.125	-.129	-.075	-.127	-.092
38. Other students decide what I am to do in a class project.	-.076	.041	-.196	.059	-.063	-.051	.284	.227	.370	.442
49. I enjoy doing school work by myself.	.342	.076	.084	.145	.101	.049	.104	-.152	-.077	.006

D-7

APPENDIX E

Results of Analysis of Variance and
Discriminant Analyses of Classroom Observation Data

APPENDIX E

Variable in the Analysis of Variance

17VIT = More than one adult in the classroom involved with students

21V5T = More than one activity group

Variables in the Discriminant Analyses

Student Influence

V21 = Low student influence

V23 = High student influence

Number of Students Engaged with Teacher

V42 = One or two students engaged

V43 = Three to nine students engaged

V44 = Ten or more students engaged

Teacher Activity

V52 = Consultation (working on a 1 to 1 basis with students)

V53 = Discussion/Lecture

V54 = Working alone

V55 = Monitoring students

V56 = Distributing materials/Giving directions

OBSERVATION CYCLE 1: MORE THAN ONE ADULT IN CLASSROOM

Analysis of Variance

		SUM OF SQUARES	DF	MEAN SQUARE	F RATIO	PROB. F EXCEEDED
MEAN	1.012	BETWEEN	1.2724	2	0.6362	0.3649
S. DEV.	1.303	WITHIN	81.9538	47	1.7437	0.6962
N	50.	TOTAL	83.2262	49		
MAXIMUM	3.142					
MINIMUM	0.0					

Level of Utilization

LoU Group	Low	Mid	High
MEAN	1.145	0.628	0.943
S. DEV.	1.405	0.860	1.235
N	25.000	5.000	20.000
MAXIMUM	3.142	1.571	3.142
MINIMUM	0.0	0.0	0.0

E-3

OBSERVATION CYCLE 2: MORE THAN ONE ADULT IN CLASSROOM

Analysis of Variance

		SUM OF SQUARES	DF	MEAN SQUARE	F RATIO	PROB. F EXCEEDED
MEAN	0.819	BETWEEN	0.8760	2	0.4380	0.3091
S. DEV.	1.174	WITHIN	69.4390	49	1.4171	0.7355
N	52	TOTAL	70.3150	51		
MAXIMUM	3.142					
MINIMUM	0.0					

Level of Utilization

	Low	Mid	High
MEAN	0.731	0.628	0.973
S. DEV.	0.628	1.405	1.363
N	26.000	5.000	21.000
MAXIMUM	3.142	3.142	3.142
MINIMUM	0.0	0.0	0.0

E-4

OBSERVATION CYCLE 3: MORE THAN ONE ADULT IN CLASSROOM

 15 1 1
 22 14

Analysis of Variance

		SUM OF SQUARES	DF	MEAN SQUARE	F RATIO	PROB. F EXCEEDED
MEAN	0.893	BETWEEN	1.8550	2	0.9275	0.7149
S. DEV.	1.133	WITHIN	63.5719	49	1.2974	0.4943
N	52	TOTAL	65.4269	51		
MAXIMUM	3.142					
MINIMUM	0.0					

Level of Utilization

	Low	Mid	High
MEAN	0.956	0.314	0.956
S. DEV.	1.262	0.703	1.344
N	26.000	5.000	21.000
MAXIMUM	3.142	1.571	3.142
MINIMUM	0.0	0.0	0.0

E-5

OBSERVATION CYCLE 1: MORE THAN ONE ACTIVITY GROUP

Analysis of Variance

		SUM OF SQUARES		DF	MEAN SQUARE	F RATIO	PROB. F EXCEEDED
MEAN	2.657	BETWEEN	0.3399	2	0.1700	0.7057	0.4989
S. DEV.	0.488	WITHIN	11.3188	47	0.2408		
N	50.	TOTAL	11.6587	49			
MAXIMUM	3.142						
MINIMUM	1.263						

Level of Utilization

	Low	Mid	High
MEAN	2.577	2.683	2.751
S. DEV.	0.540	0.237	0.458
N	25.000	5.000	20.000
MAXIMUM	3.142	3.142	3.142
MINIMUM	1.266	2.394	1.875

E-6

OBSERVATION CYCLE 2: MORE THAN ONE ACTIVITY GROUP

Analysis of Variance

			SUM OF SQUARES	DF	MEAN SQUARE	F RATIO	PROB. F EXCEEDED
MEAN	2.698	BETWEEN	2.6570	2	1.3285	5.7407	0.0058
S. DEV.	0.524	WITHIN	11.3393	49	0.2314		
N	52	TOTAL	13.9963	51			
MAXIMUM	3.142						
MINIMUM	1.301						

Level of Utilization

	Low	Mid	High
MEAN	2.474	3.013	2.900
S. DEV.	0.598	0.288	0.344
N	26.000	5.000	21.000
MAXIMUM	3.142	3.142	3.142
MINIMUM	1.301	2.458	2.054

E-7

OBSERVATION CYCLE 3: MORE THAN ONE ACTIVITY GROUP

Analysis of Variance

		SSM OF SQUARES	DF	MEAN SQUARE	F RATIO	PROB. F EXCEEDED	
MEAN	2.675	BETWEEN	2.3652	2	1.1826	4.1065	0.0224
S. DEV.	0.568	WITHIN	14.1108	49	0.2880		
N	52	TOTAL	16.4760	51			
MAXIMUM	3.142						
MINIMUM	1.266						

Level of Utilization

	Low	Mid	High
MEAN	2.462	2.868	2.893
S. DEV.	0.620	0.613	0.387
N	26.000	5.000	21.000
MAXIMUM	3.142	3.142	3.142
MINIMUM	1.266	1.772	1.582

E-8

ALL OBSERVATION CYCLES COMBINED: MORE THAN ONE ACTIVITY

Analysis of Variance

			SUM OF SQUARES	DF	MEAN SQUARE	F RATIO	PROB. F EXCEEDED
MEAN	2.532	BETWEEN	1.4618	2	0.7309	5.7270	0.0058
S. DEV.	0.389	WITHIN	6.2538	49	0.1276		
N	52.	TOTAL	7.7156	51			
MAXIMUM	3.142						
MINIMUM	1.571						

Level of Utilization

	Low	Mid	High
MEAN	2.414	2.729	2.754
S. DEV.	0.437	0.225	0.253
N	26.000	5.000	21.000
MAXIMUM	3.142	2.902	3.142
MINIMUM	1.571	2.346	2.346

E-9

DISCRIMINANT ANALYSIS
TEACHER OBSERVATION CYCLE 1: STUDENT INFLUENCE

----- DISCRIMINANT ANALYSIS -----

ANALYSIS NUMBER 1

SOLUTION METHOD - DIRECT.

PRICE PROBABILITIES -

GROUP 1 GROUP 2 GROUP 3

0.33333 0.33333 0.33333

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	:	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQUARE	DF	SIGNIFICANCE
1	0.11415	55.00	0.320	:	0	0.8922	5.305	4	0.257
2	0.00601	5.00	0.077	:	1	0.9940	0.279	1	0.598

REMAINING COMPUTATIONS WILL BE BASED ON 2 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V21	0.71929	1.57556
V22	-2.00405	1.39795

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V21	0.53323	1.16801
V22	-1.49606	1.04360
CONSTANT	1.22356	-2.94456

E-10

288

DISCRIMINANT ANALYSIS
TEACHER OBSERVATION CYCLE 2: STUDENT INFLUENCE

----- DISCRIMINANT ANALYSIS -----

ANALYSIS NUMBER 1

SOLUTION METHOD - DIRECT.

PRIOR PROBABILITIES -

GROUP 1	GROUP 2	GROUP 3
0.33333	0.33333	0.33333

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQUARE	DF	SIGNIFICANCE
1	0.05079	83.77	0.220	0	0.9424	2.878	4	0.579
2	0.00584	16.23	0.055	1	0.9903	0.475	1	0.491

REMAINING COMPUTATIONS WILL BE BASED ON 2 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V21	0.69875	1.21509
V23	1.12624	-0.35220

UNSTANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V21	0.42567	1.09153
V23	1.05760	-0.34509
CONSTANT	-1.50020	-1.00732

DISCRIMINANT ANALYSIS
DISCRIMINANT ANALYSIS ON TEACHER OBSERVATION CIRCLE 37 STUDENT INTELLIGENCE

----- DISCRIMINANT ANALYSIS -----

ANALYSIS NUMBER 1

SOLUTION METHOD - DIRECT.

PRIOR PROBABILITIES -

GROUP	1	GROUP	2	GROUP	3
	0.33333		0.33333		0.33333

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	:	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQUARE	DF	SIGNIFICANCE
1	0.05299	58.83	0.224	:	0	0.9451	2.534	4	0.638
2	0.00062	1.17	0.025	:	1	0.9994	0.030	1	0.862

REMAINING COMPUTATIONS WILL BE BASED ON 2 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V21	-0.47527	1.07130
V23	1.26455	0.73655

UNSTANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V21	-0.36465	0.82154
V23	1.07125	0.62280
CONSTANT	-0.53785	-1.53147

E-12

292

DISCRIMINANT ANALYSIS
DISCRIMINANT ANALYSIS ON ALL TEACHER OBSERVATION CYCLES COMBINED - STUDENT PERFORMANCE

----- DISCRIMINANT ANALYSIS -----

ANALYSIS NUMBER 1

SOLUTION METHOD - DIRECT.

PRIC PROBABILITIES -

GRCLP 1 GRCLP 2 GRCLP 3

0.33333 0.33333 0.33333

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	:	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQUARE	DF	SIGNIFICANCE
1	0.12630	89.41	0.335	:	0	0.8748	6.489	4	0.165
2	0.01496	10.59	0.121	:	1	0.9853	0.720	1	0.396

REMAINING COMPUTATIONS WILL BE BASED ON 2 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V21	-0.53260	1.06022
V23	1.23150	0.76733

UNSTANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V21	-0.65376	1.37843
V23	1.73557	1.07865
CONSTANT	-1.06138	-3.02667

DISCRIMINANT ANALYSIS
TEACHER OBSERVATION CYCLE 1: NUMBER OF STUDENTS ENGAGED

----- DISCRIMINANT ANALYSIS -----

ANALYSIS NUMBER 1

SOLUTION METHOD - DIRECT.

PRICR PROBABILITIES -

GROUP 1 GROUP 2 GROUP 3

0.33333 0.33333 0.33333

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	:	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQUARE	DF	SIGNIFICANCE
1	0.32153	80.46	0.493	:	0	0.7019	16.284	6	0.012
2	0.07810	19.54	0.265	:	1	0.9276	3.455	2	0.177

REMAINING COMPUTATIONS WILL BE BASED ON 2 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V42	1.37387	-1.08059
V43	0.24902	-1.15416
V44	3.04318	-1.01696

UNSTANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V42	2.34618	-1.84534
V43	0.38064	-1.82529
V44	4.07775	-1.35382
CONSTANT	-7.89063	4.95402

E-14

296

DISCRIMINANT ANALYSIS
TEACHER OBSERVATION CYCLE 2: NUMBER OF STUDENTS ENGAGED

----- DISCRIMINANT ANALYSIS -----

ANALYSIS NUMBER 1

SOLUTION METHOD - DIRECT.

PRICR PROBABILITIES -

GROUP	1	GROUP	2	GROUP	3
	0.33333		0.33333		0.33333

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	:	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQUARE	DF	SIGNIFICANCE
1	0.31090	68.63	0.487	:	0	0.6687	19.316	6	0.004
2	0.14077	31.17	0.351	:	1	0.8766	6.322	2	0.042

REMAINING COMPUTATIONS WILL BE BASED ON 2 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V42	-0.04566	1.66979
V43	0.29446	-0.58231
V44	2.07507	0.84640

UNSTANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V42	-0.10845	3.64644
V43	0.61803	-1.21395
V44	3.56880	1.45911
CONSTANT	-4.32532	-6.02972

E-15

DISCRIMINANT ANALYSIS
DISCRIMINANT ANALYSIS ON TEACHER OBSERVATION CYCLE 3 : A STUDENTS ENGAGED

NUMBER OF

----- DISCRIMINANT ANALYSIS -----

ANALYSIS NUMBER 1

SOLUTION METHOD - DIRECT.

PRICR PRECAILITIES -

GRUP 1 GRUP 2 GRUP 3

C.33333 C.33333 0.33333

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQUARE	DF	SIGNIFICANCE
1	C.05677	54.28	0.300	0	0.9047	4.808	6	0.569
2	C.00600	5.72	0.077	1	0.9940	0.287	2	0.866

REMAINING COMPTATIONS WILL BE BASED ON 2 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V42	0.28736	2.78357
V43	-1.16471	-1.04043
V44	1.92052	-0.07091

UNSTANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V42	0.50819	4.92331
V43	-1.52652	-1.72275
V44	2.41226	-0.08907
CONSTANT	-2.86483	-5.34666

E-16

300

DISCRIMINANT ANALYSIS
ALL OBSERVATION CYCLES COMBINED: NUMBER OF STUDENTS ENGAGED

----- DISCRIMINANT ANALYSIS -----

ANALYSIS NUMBER 1

SOLUTION METHOD - DIRECT.

PRIOR PROBABILITIES -

CRCLP 1 CRCLP 2 GFCUP 3

0.33333 0.33333 0.33333

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQUARE	DF	SIGNIFICANCE
1	0.35557	75.58	0.512	0	0.6617	19.822	6	0.003
2	0.11487	24.42	0.321	1	0.8970	5.219	2	0.074

REMAINING COMPUTATIONS WILL BE BASED ON 2 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V42	-0.17414	1.68717
V43	-0.74125	0.46807
V44	2.38161	1.24568

UNSTANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V42	-0.53364	5.17012
V43	-1.72373	1.08847
V44	4.45476	2.55160
CONSTANT	-3.74393	-10.57024

E-17

DISCRIMINANT ANALYSIS
TEACHER OBSERVATION CYCLE 1: TEACHER ACTIVITY

-----DISCRIMINANT ANALYSIS-----

ANALYSIS NUMBER 1

COLLECTION METHOD - DIRECT.

PRIOR PROBABILITIES -

GROUP 1 GROUP 2 GROUP 3

0.33333 0.33333 0.33333

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQUARE	DF	SIGNIFICANCE
1	0.62341	70.47	0.620	0	0.4884	32.249	10	0.000
2	0.26126	29.53	0.455	1	0.7929	10.445	4	0.034

REMAINING COMPUTATIONS WILL BE BASED ON 2 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V52	-0.92580	-0.64179
V53	-1.36021	-1.23569
V54	-0.45174	-1.55550
V55	-2.21164	-0.84041
V56	0.12653	-1.04878

UNSTANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V52	-1.72423	-1.10530
V53	-2.79540	-2.54645
V54	-1.24131	-3.52660
V55	-3.79797	-1.44306
V56	0.33742	-2.75317
CONSTANT	7.54760	7.71585

E-18

DISCRIMINANT ANALYSIS
TEACHER OBSERVATION CYCLE 2: TEACHER ACTIVITY

-----DISCRIMINANT ANALYSIS-----

ANALYSIS NUMBER 1

SOLUTION METHOD - DIRECT.

PRIOR PROBABILITIES -

GROUP 1 GROUP 2 GROUP 3

0.33333 0.33333 0.33333

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	: : : : : :	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQUARE	DF	SIGNIFICANCE
1	0.53517	77.48	0.590	:	0	0.5637	26.940	10	0.003
2	0.15553	22.52	0.367	:	1	0.8654	6.794	4	0.147

REMAINING COMPUTATIONS WILL BE BASED ON 2 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V52	0.47812	-0.17075
V53	0.10437	-1.58314
V54	1.74194	-0.46264
V55	0.07557	-0.63756
V56	0.90119	-0.93244

UNSTANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V52	1.17589	-0.41955
V53	0.21607	-3.27742
V54	4.52565	-1.20247
V55	0.17855	-1.87945
V56	2.31618	-2.35650
CONSTANT	-4.41187	6.93904

E-19

DISCRIMINANT ANALYSIS
DISCRIMINANT ANALYSIS ON TEACHER OBSERVATION CYCLE 3 : TEACHER ACTIVITY

-----DISCRIMINANT ANALYSIS-----

ANALYSIS NUMBER 1

SELECTION METHOD - DIRECT.

PRICE PROBABILITIES -

GROUP 1 GROUP 2 GROUP 3

0.33333 0.33333 0.33333

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	:	FUNCTIONS DEPIVED	WILKS' LAMBDA	CHI-SQUARE	DF	SIGNIFICANCE
1	0.24910	43.48	0.447	:	0	0.7010	16.698	10	0.081
2	0.14208	36.32	0.353	:	1	0.8756	6.244	4	0.182

REMAINING COMPUTATIONS WILL BE BASED ON 2 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V52	0.30873	0.70489
V53	0.33927	1.40841
V54	0.61170	-0.05438
V55	0.91530	1.46548
V56	0.66545	-0.52249

UNSTANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V52	0.52973	1.20947
V53	0.54514	2.26302
V54	1.50791	-0.13406
V55	1.72562	2.76318
V56	2.32153	-1.40156
CONSTANT	-4.21741	-4.86689

E-20

DISCRIMINANT ANALYSIS
ALL OBSERVATION CYCLES COMBINED: TEACHER ACTIVITY

28

----- DISCRIMINANT ANALYSIS -----

ANALYSIS NUMBER 1

SCALING METHOD - DIRECT.

PRICR PROBABILITIES -

GROUP 1 GROUP 2 GROUP 3

0.33333 0.33333 0.33333

DISCRIMINANT FUNCTION	EIGENVALUE	RELATIVE PERCENTAGE	CANONICAL CORRELATION	:	FUNCTIONS DERIVED	WILKS' LAMBDA	CHI-SQUARE	DF	SIGNIFICANCE
1	0.52364	59.41	0.586	:	0	0.4834	34.168	10	0.000
2	0.35781	40.59	0.513	:	1	0.7365	14.376	4	0.006

REMAINING COMPUTATIONS WILL BE BASED ON 2 DISCRIMINANT FUNCTION(S)

STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V52	0.46036	-0.56879
V53	0.13205	-1.24627
V54	1.37397	-0.64443
V55	-0.20747	-1.38521
V56	0.56455	-0.53038

UNSTANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS

	FUNC 1	FUNC 2
V52	1.46614	-1.81147
V53	0.35685	-3.74533
V54	4.30651	-2.64676
V55	-0.61177	-4.05643
V56	3.82460	-2.09868
CONSTANT	-5.79636	11.83735

E-21

APPENDIX F

**Student Interview Responses
by Level of Implementation and Grade**

APPENDIX F

Total Number of Responses and Percentage of Total Responding
in Direction Consistent with Independent Learning System by Level of Implementation
and Grade for Five Student Interview Items

Level of Implementation	Stated Learning Objective		Discussed Objective With Teacher		Student Influence in Choosing Objective				Stated Deadline		Described End Product	
	N*	% Yes	N	% Yes	N	% Low	% Mid	% High	N	% Yes	N	% Yes
<u>Low</u>												
Grade 4	45	100	44	9.0	45	84.4	15.56	0	42	54.8	43	88.4
Grade 5	54	92.6	55	10.9	55	74.5	20	5.4	55	54.5	51	88.2
Grade 6	40	97.5	40	5.0	40	75.0	7.5	17.5	40	82.5	39	92.3
TOTAL	139	96.4	139	8.6	140	77.8	15.0	7.1	137	62.8	133	89.5
<u>Mid</u>												
Grade 4	6	100	6	33.3	6	16.7	0	83.3	6	66.7	6	100
Grade 5	11	100	11	63.6	11	0	36.4	63.6	11	63.6	11	100
Grade 6	5	100	5	100	5	0	0	100	5	100	2	100
TOTAL	22	100	22	63.6	22	4.6	18.2	77.3	22	72.7	19	100
<u>High</u>												
Grade 4	49	95.9	49	36.7	49	18.4	6.12	75.5	49	67.3	48	87.5
Grade 5	23	95.7	23	21.7	23	43.5	17.4	39.1	23	91.3	22	100
Grade 6	48	100	47	66.0	48	29.2	4.2	66.7	48	72.9	48	87.5
TOTAL	120	97.5	119	43.4	120	27.5	7.5	6.5	120	74.2	118	89.8

* Total number of responses to item.

F-2

APPENDIX G

**Summary Tables for Multiple Regression Analyses
by Grade Level for each Dependent Variable**

APPENDIX G

Notation:

Multiple R = multiple correlation coefficient

R square = squared multiple correlation coefficient

RSQ change = change in R square when variable is added

Simple R = zero-order correlation of dependent variable and independent variable

B = Unstandardized regression coefficient

BETA = standardized regression coefficient

Constant = Y intercept

D5 = Grade 5 dummy variable

D6 = Grade 6 dummy variable

Summaries of the stepwise regression analyses provide information on all variables entering the final regression equation. Variables were required to meet the following criteria in order to enter:

- 1) the F-ratio, testing the significance of the regression coefficient if the variable was entered must be greater than .01.
- 2) the tolerance or proportion of variance of the variable not explained by the independent variables already in the equation must be greater than .001.

REGRESSION ANALYSES
REGRESSION ON WORK-STUDY SKILLS (PCST): GRADE 4

***** MULTIPLE REGRESSION ***** VARIABLE LIST
DEPENDENT VARIABLE.. T17 WORK-STUDY SKILLS--POST REGRESSION LIST

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	MSO CHANCE	SIMPLE R	B	BETA
T15	VERBAL ABILITY	0.63640	0.40756	0.40756	0.63840	0.30217	0.4349
T16	WORK-STUDY SKILLS--PRE	0.67066	0.44982	0.04226	0.53124	0.23106	0.1901
T34	LEVEL OF INDEPENDENCE--TOTAL--PRE	0.67618	0.45993	0.01011	0.27230	0.22815	0.08660
T46	LEVEL OF IMPLEMENTATION	0.69627	0.48479	0.02486	-0.26675	-0.75763	-0.1426
T47	TARGET DUMMY	0.69701	0.48582	0.00104	-0.04266	-0.59403	-0.0575
T50	IMPLEMENTATION LEVEL BY VERBAL ABILITY	0.69757	0.48633	0.00051	0.28360	0.00949	0.03550
T23	SOCIAL CLIMATE SCALE--PACE	0.71512	0.51140	0.02507	-0.08315	-0.30838	-0.20471
T49	IMPLEMENTATION LEVEL BY PRE LOG	0.71516	0.51146	0.00006	-0.11195	-0.02310	-0.03711
T21	SOCIAL CLIMATE SCALE--CLARITY	0.72617	0.52732	0.01587	0.23444	0.24779	0.17367
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.73081	0.53409	0.00677	0.19182	0.11154	0.09601
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.73506	0.54032	0.00622	-0.22850	0.14023	0.10642
T40	LEVEL OF INDEPENDENCE--TOTAL--DELAY	0.73629	0.54508	0.00476	0.24590	0.28617	0.07655
(CONSTANT)						-0.04613	

REGRESSION ANALYSES
REGRESSION ON WORK-STUDY SKILLS (PCST): GRADE 5

***** MULTIPLE REGRESSION ***** VARIABLE LIST 2
DEPENDENT VARIABLE.. T17 WORK-STUDY SKILLS--POST REGRESSION LIST 1

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T16	WORK-STUDY SKILLS--PRE	0.76250	0.58141	0.58141	0.76250	0.55864	0.53034
T15	VERBAL ABILITY	0.79366	0.62990	0.04845	0.68608	0.18314	0.27816
T26	LEVEL OF INDEPENDENCE--TOTAL--PRE	0.79738	0.63581	0.00591	0.38275	-0.11964	-0.03862
T46	LEVEL OF IMPLEMENTATION	0.80257	0.64476	0.00894	0.24146	-1.04651	-0.15283
T47	TARGET DUMMY	0.80327	0.64524	0.00048	0.02944	0.16145	0.01352
T49	IMPLEMENTATION LEVEL BY PRE LUI	0.80503	0.64807	0.00282	0.36475	0.23287	0.30863
T50	IMPLEMENTATION LEVEL BY VERBAL ABILITY	0.80517	0.64829	0.00023	0.56336	-0.00850	-0.03723
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.81292	0.66083	0.01254	-0.21485	-0.17737	-0.10036
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.81388	0.66240	0.00157	-0.15712	0.06440	0.04923
T21	SOCIAL CLIMATE SCALE--CLARITY	0.81429	0.66307	0.00068	0.16366	0.04733	0.02763
T23	SOCIAL CLIMATE SCALE--PACE	0.81461	0.66360	0.00052	-0.28917	-0.04447	-0.02774
T48	LEVEL OF INDEPENDENCE--TOTAL--DELAY	0.81464	0.66363	0.00004	0.28697	0.02487	0.00666
(CONSTANT)						5.96827	

REGRESSION ANALYSES
REGRESSION ON WORK-STUDY SKILLS (POST): GRADE 6

***** MULTIPLE REGRESSION ***** VARIABLE LIST 3
REGRESSION LIST 1

DEPENDENT VARIABLE.. T17 WORK-STUDY SKILLS--POST

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T16	WORK-STUDY SKILLS--PFE	0.60907	0.65455	0.65455	0.60907	0.45379	0.53344
T15	VERBAL ABILITY	0.63116	0.69082	0.03623	0.75390	0.22095	0.34746
T36	LEVEL OF INDEPENDENCE--TOTAL--PRE	0.63604	0.69896	0.00814	0.25046	0.26581	0.08872
T46	LEVEL OF IMPLEMENTATION	0.63723	0.70095	0.00195	0.00004	1.62750	0.27158
T47	TARGET DUMMY	0.63743	0.70128	0.00033	-0.01153	-0.50037	-0.04422
T50	IMPLEMENTATION LEVEL BY VERBAL ABILITY	0.63817	0.70253	0.00125	0.44775	-0.02786	-0.15122
T45	IMPLEMENTATION LEVEL BY PRE LOI	0.63857	0.70320	0.00067	0.11272	-0.08383	-0.12554
T46	LEVEL OF INDEPENDENCE--TOTAL--DELAY	0.64828	0.71958	0.01637	0.47590	0.56998	0.14484
T21	SOCIAL CLIMATE SCALE--CLARITY	0.65177	0.72551	0.00594	0.28423	0.13563	0.06406
T23	SOCIAL CLIMATE SCALE--FACE	0.65207	0.72603	0.00052	0.07017	0.05686	0.03506
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.65223	0.72630	0.00027	0.13487	-0.02873	-0.02195
(CONSTANT)						-7.21816	

✓
 REGRESSION ANALYSES
 REGRESSION ON SOCIAL STUDIES ACHIEVEMENT (POST): GRADE 4

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
 REGRESSION LIST 1
 DEPENDENT VARIABLE.. T19 SOCIAL STUDIES ACHIEVEMENT--POST

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T15	VERBAL ABILITY	0.57320	0.32856	0.32856	0.57320	0.12571	0.28662
T16	SOCIAL STUDIES ACHIEVEMENT--PRE	0.62710	0.39326	0.06470	0.55560	0.24584	0.25292
T36	LEVEL OF INDEPENDENCE--TCTAL--PRE	0.65392	0.42761	0.03435	0.37965	0.25829	0.17552
T46	LEVEL OF IMPLEMENTATION	0.66942	0.44813	0.02052	-0.20827	-0.33383	-0.09793
T47	TARGET DUMMY	0.67104	0.45037	0.00224	-0.04755	-0.31159	-0.04703
T50	IMPLEMENTATION LEVEL BY VERBAL ABILITY	0.67146	0.45088	0.00051	0.28277	-0.00446	-0.02735
T45	IMPLEMENTATION LEVEL BY PRE LSI	0.67156	0.45103	0.00015	0.00055	-0.01032	-0.02586
T21	SOCIAL CLIMATE SCALE--CLARITY	0.68553	0.46995	0.01892	0.36013	0.08591	0.09260
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.68975	0.47576	0.00580	-0.34525	-0.07583	-0.08570
T46	LEVEL OF INDEPENDENCE--TCTAL--DELAY	0.69195	0.47860	0.00304	0.27964	0.14986	0.06304
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.69363	0.48112	0.00232	0.22628	0.03870	0.05171
(CONSTANT)						1.58125	

REGRESSION ANALYSES
REGRESSION ON SOCIAL STUDIES ACHIEVEMENT (PCST): GRADE 5

***** MULTIPLE REGRESSION ***** VARIABLE LIST 3
REGRESSION LIST 1
DEPENDENT VARIABLE.. T19 SOCIAL STUDIES ACHIEVEMENT--POST

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T18	SOCIAL STUDIES ACHIEVEMENT--PRE	0.69549	0.48371	0.48371	0.69549	0.42054	0.41717
T19	VERBAL ABILITY	0.75368	0.56804	0.08432	0.67272	0.17740	0.45894
T36	LEVEL OF INDEPENDENCE--TOTAL--PRE	0.75379	0.56820	0.00016	0.33793	0.08754	0.04798
T48	LEVEL OF IMPLEMENTATION	0.75747	0.57376	0.00554	0.20713	0.89387	0.22214
T47	TARGET DUMMY	0.75848	0.57529	0.00153	0.03282	0.15745	0.02904
T50	IMPLEMENTATION LEVEL BY VERBAL ABILITY	0.76039	0.57819	0.00290	0.50820	-0.01830	-0.13673
T49	IMPLEMENTATION LEVEL BY PRE LOI	0.76080	0.57882	0.00064	0.29987	-0.03798	-0.08594
T23	SOCIAL CLIMATE SCALE--PACE	0.76380	0.58340	0.00457	-0.28531	-0.09350	-0.09508
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.76620	0.58706	0.00366	-0.11255	0.05052	0.06565
T21	SOCIAL CLIMATE SCALE--CLARITY	0.76638	0.58733	0.00027	0.14731	0.02798	0.02775
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.76669	0.58782	0.00049	-0.15504	0.02653	0.02547
(CONSTANT)						1.82152	

REGRESSION ANALYSES
 REGRESSION ON SOCIAL STUDIES ACHIEVEMENT (POST): GRADE 6

***** MULTIPLE REGRESSION ***** VARIABLE LIST :
 DEPENDENT VARIABLE.. T15 SOCIAL STUDIES ACHIEVEMENT--POST REGRESSION LIST 1

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T15	VERBAL ABILITY	0.64461	0.41552	0.41552	0.64461	0.13003	0.36478
T18	SOCIAL STUDIES ACHIEVEMENT--PRE	0.69179	0.47857	0.06305	0.63221	0.34659	0.35832
T36	LEVEL OF INDEPENDENCE--TOTAL--PRE	0.70611	0.49859	0.02002	0.27612	0.33950	0.21019
T47	TARGET CLUMPY	0.71064	0.50530	0.00671	-0.04601	-0.35653	-0.05874
T48	LEVEL OF IMPLEMENTATION	0.71118	0.50577	0.00047	-0.01463	0.52847	0.16422
T50	IMPLEMENTATION LEVEL BY VERBAL ABILITY	0.71165	0.50644	0.00067	0.37903	-0.00111	-0.01127
T49	IMPLEMENTATION LEVEL BY PRE LOI	0.71174	0.50658	0.00014	0.11901	-0.03962	-0.12291
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.72026	0.51878	0.01220	-0.02982	-0.13575	-0.19223
T21	SOCIAL CLIMATE SCALE--CLARITY	0.72569	0.52662	0.00784	0.25196	0.08549	0.09820
T23	SOCIAL CLIMATE SCALE--PACE	0.72933	0.53192	0.00530	0.01673	0.08119	0.09293
T46	LEVEL OF INDEPENDENCE--TOTAL--DELAY	0.73045	0.53356	0.00164	0.31332	-0.10826	-0.05101
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.73052	0.53366	0.00010	-0.18268	-0.01230	-0.01278
(CONSTANT)						2.51573	

REGRESSION ANALYSES
REGRESSION ON LEVEL OF INDEPENDENCE (DELAY) : GRADE 4

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST 1

DEPENDENT VARIABLE.. T46 LEVEL OF INDEPENDENCE--TCT AL--DELAY

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSC CHANGE	SIMPLE R	B	BETA
T34	LEVEL OF INDEPENDENCE--TOTAL--PRE	0.31596	0.09983	0.09983	0.31596	-0.06225	-0.08828
T16	WORK-STUDY SKILLS--PRE	0.36572	0.13375	0.03393	0.22381	0.05943	0.18271
T15	VERBAL ABILITY	0.36682	0.13456	0.00091	0.21216	-0.02272	-0.12218
T48	LEVEL OF IMPLEMENTATION	0.37517	0.14377	0.00921	0.04396	-0.01778	-0.57517
T47	TARGET DUMMY	0.38150	0.14554	0.00177	0.05002	0.15401	0.05574
T46	IMPLEMENTATION LEVEL BY PRE LOI	0.42135	0.17754	0.03200	0.22483	0.12059	0.72567
T50	IMPLEMENTATION LEVEL BY VERBAL ABILITY	0.42358	0.17942	0.00188	0.20325	0.00732	0.10242
T17	WORK-STUDY SKILLS--POST	0.43541	0.18958	0.01017	0.24590	0.03694	0.13800
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.44267	0.19596	0.00637	-0.18628	-0.03009	-0.08533
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.44354	0.19673	0.00077	0.04150	-0.00920	-0.02958
(CONSTANT)						8.50410	

REGRESSION ANALYSES
REGRESSION ON LEVEL OF INDEPENDENCE (DELAY): GRADE 5

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST 1
DEPENDENT VARIABLE.. T46 LEVEL OF INDEPENDENCE--TOTAL--DELAY

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T15	VERBAL ABILITY	0.31312	0.09805	0.09805	0.31312	0.04313	0.24695
T16	WORK-STUDY SKILLS--PRE	0.33096	0.10453	0.01148	0.29384	0.24665	0.15579
T36	LEVEL OF INDEPENDENCE--TOTAL--PRE	0.34236	0.11721	0.00769	0.21373	-0.04131	-0.05527
T47	TARGET DUMMY	0.36180	0.13090	0.01369	0.12198	0.27730	0.12267
T48	LEVEL OF IMPLEMENTATION	0.36195	0.13101	0.00011	0.06638	-0.25700	-0.14782
T49	IMPLEMENTATION LEVEL BY PRE LCI	0.36720	0.13483	0.00382	0.15546	0.07354	0.36791
T50	IMPLEMENTATION LEVEL BY VERBAL ABILITY	0.36508	0.13622	0.00139	0.22474	-0.00961	-0.15873
T21	SOCIAL CLIMATE SCALE--CLARITY	0.38701	0.14977	0.01355	0.14539	0.04845	0.10660
T23	SOCIAL CLIMATE SCALE--PACE	0.39516	0.15615	0.00637	-0.04715	0.04385	0.10320
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.39705	0.15765	0.00150	-0.12657	-0.01953	-0.04167
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.39775	0.15821	0.00056	-0.07026	-0.00546	-0.02725
T17	WORK-STUDY SKILLS--POST	0.39787	0.15830	0.00009	0.28697	0.00438	0.01651
(CONSTANT)						5.56011	

REGRESSION ANALYSES
REGRESSION ON LEVEL OF INDEPENDENCE (DELAY): GRADE 6

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST 1

DEPENDENT VARIABLE.. T46 LEVEL OF INDEPENDENCE--TOTAL--DELAY

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSC CHANGE	SIMPLE R	B	BETA
T34	LEVEL OF INDEPENDENCE--TOTAL--PRE	0.41964	0.17610	0.17610	0.41964	0.26132	0.34324
T15	VERBAL ABILITY	0.53747	0.28887	0.11278	0.41446	-0.37706	-0.34369
T16	WORK-STUDY SKILLS--PRE	0.54263	0.29445	0.00557	0.37714	-0.00705	-0.02995
T47	TARGET DUMMY	0.55554	0.30862	0.01417	0.11341	0.44265	0.15365
T48	LEVEL OF IMPLEMENTATION	0.55613	0.30923	0.00066	-0.00627	-0.19179	-0.11935
T50	IMPLEMENTATION LEVEL BY VERBAL ABILITY	0.55864	0.31208	0.00280	0.26077	0.01159	0.24754
T49	IMPLEMENTATION LEVEL BY PRE LOI	0.55887	0.31233	0.00026	0.18507	-0.00625	-0.03800
T17	WORK-STUDY SKILLS--POST	0.59183	0.35027	0.03793	0.47590	0.08421	0.33139
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.63729	0.36880	0.01853	-0.22563	-0.06884	-0.16368
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.60954	0.37154	0.00274	0.06549	-0.01605	-0.04825
T21	SOCIAL CLIMATE SCALE--CLARITY	0.61030	0.37246	0.00092	0.22204	-0.01731	-0.04222
(CONSTANT)						8.19982	

G-11

REGRESSION ANALYSES
REGRESSION ON CLICAL CLALITY

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST 1
DEPENDENT VARIABLE.. T25 PRODUCT EVALUATION: GLOBAL QUALITY

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T36	LEVEL OF INDEPENDENCE--TOTAL--PRE	0.18997	0.03609	0.03609	0.18997	2.48019	0.81499
T15	VERBAL ABILITY	0.19790	0.03916	0.00307	-0.01114	-0.28424	-0.43064
T48	LEVEL OF IMPLEMENTATION	0.34451	0.11865	0.07953	0.29727	7.26952	1.10512
C5		0.38549	0.14860	0.02991	-0.27165	-2.20764	-0.15604
C6		0.38738	0.15006	0.00146	0.19119	0.87554	0.06758
T45	IMPLEMENTATION LEVEL BY FRE LUI	0.44325	0.19647	0.04641	0.28658	-0.35525	-1.24102
T50	IMPLEMENTATION LEVEL BY VERBAL ABILITY	0.45043	0.20833	0.01186	0.19536	0.06670	0.27756
T17	WORK-STUDY SKILLS--FCST	0.50551	0.25554	0.04721	0.11156	0.42292	0.41792
T15	SOCIAL STUDIES ACHIEVEMENT--POST	0.51073	0.26701	0.01147	-0.02924	-0.42573	-0.22774
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.53301	0.28409	0.01705	-0.01229	-0.22398	-0.13282
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.53840	0.28988	0.00578	0.08272	-0.10567	-0.08527
(CONSTANT)						38.37997	

REGRESSION ANALYSES
REGRESSION ON COGNITIVE QUALITY

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
DEPENDENT VARIABLE.. T26 PRODUCT EVALUATION: COGNITIVE QUALITY REGRESSION LIST 1

SUMMARY TABLE

VARIABLE /		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T26	LEVEL OF INDEPENDENCE--TOTAL--PRE	0.24808	0.06154	0.06154	0.24808	1.91217	0.69546
T15	VERBAL ABILITY	0.31397	0.09858	0.03703	0.24345	-0.18172	-0.39238
T48	LEVEL OF IMPLEMENTATION	0.37142	0.13795	0.03938	0.15787	4.75178	1.03817
C5		0.37917	0.14377	0.00582	-0.09805	-0.70082	-0.07060
C6		0.38399	0.14745	0.00368	0.15473	-0.72272	-0.07558
T49	IMPLEMENTATION LEVEL BY PRE LOG	0.42948	0.18445	0.03700	0.20260	-0.68425	-1.41504
T50	IMPLEMENTATION LEVEL BY VERBAL ABILITY	0.47649	0.22752	0.04307	0.34451	0.05092	0.23523
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.52130	0.27175	0.04423	-0.16408	-0.25483	-0.24517
T17	WORK-STUDY SKILLS--POST	0.53922	0.29076	0.01901	0.27314	0.11459	0.16138
T16	SOCIAL STUDIES ACHIEVEMENT--POST	0.54206	0.29383	0.00307	0.24872	0.12759	0.09727
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.54397	0.29591	0.00208	0.10824	0.08572	0.09858
T21	SOCIAL CLIMATE SCALE--CLARITY	0.54733	0.29957	0.00367	0.06868	-0.10569	-0.08528
T23	SOCIAL CLIMATE SCALE--PACE	0.54911	0.30152	0.00194	-0.05936	-0.07186	-0.05580
(CONSTANT)						42.41210	

REGRESSION ANALYSES
REGRESSION ON COMBINED RESOURCES AND CREATIVITY SCORE

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
DEPENDENT VARIABLE.. T51 RESOURCES AND CREATIVITY SCORES COMBINED
REGRESSION LIST 1

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T15	VERBAL ABILITY	0.05373	0.00289	0.00289	-0.05373	0.68003	0.18408
T36	LEVEL OF INDEPENDENCE--TOTAL--PRE	0.06330	0.00401	0.00112	0.01375	-2.12791	-0.11341
T48	LEVEL OF IMPLEMENTATION	0.17258	0.02978	0.02578	0.16034	2.47053	0.06465
C5		0.18057	0.03260	0.00282	-0.08520	-4.62460	-0.06074
C6		0.18064	0.03263	0.00003	0.01598	-0.90653	-0.01182
T50	IMPLEMENTATION LEVEL BY VERBAL ABILITY	0.20235	0.04095	0.00831	0.03652	-0.44442	-0.34185
T45	IMPLEMENTATION LEVEL BY PRE LOG	0.21309	0.04541	0.00446	0.15360	1.48704	0.34611
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.23317	0.05437	0.00896	0.10576	1.02374	0.10042
T19	SOCIAL STUDIES ACHIEVEMENT--POST	0.23379	0.05466	0.00029	-0.02896	0.33288	0.03163
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.23421	0.05485	0.00020	0.01831	-0.07766	-0.00578
T17	WORK-STUDY SKILLS--POST	0.23449	0.05495	0.00013	-0.04973	-0.12933	-0.02116
T23	SOCIAL CLIMATE SCALE--PACE	0.23464	0.05506	0.00007	0.01117	-0.05667	-0.00544
(CONSTANT)						-8.97535	

REGRESSION ANALYSES
 REGRESSION ON SELF CONCEPT SCALE--POST: GRADE 4

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
 DEPENDENT VARIABLE.. T12 SELF CONCEPT SCALE--POST REGRESSION LIST 1

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T11	SELF CONCEPT SCALE--PRE	0.58416	0.34127	0.34127	0.58416	0.42921	0.36593
T15	VERBAL ABILITY	0.60780	0.36943	0.02816	0.43525	0.20053	0.16585
T46	LEVEL OF IMPLEMENTATION	0.61868	0.38276	0.01333	0.09322	1.35972	0.14257
T47	TARGET DUMMY	0.62712	0.39328	0.01052	-0.10941	-2.13575	-0.11524
T21	SOCIAL CLIMATE SCALE--CLARITY	0.67588	0.45682	0.06354	0.46753	0.56202	0.21852
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.68157	0.46453	0.00772	-0.38291	-0.22260	-0.09451
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.68427	0.46823	0.00365	0.21410	0.17007	0.08136
T23	SOCIAL CLIMATE SCALE--PACE	0.68636	0.47109	0.00286	-0.01551	-0.16229	-0.06016
(CONSTANT)						17.65053	

REGRESSION ANALYSES
REGRESSION ON SELF CONCEPT SCALE--POST: GRADE 5

***** MULTIPLE REGRESSION ***** VARIABLE LIST J
DEPENDENT VARIABLE.. T12 SELF CONCEPT SCALE--POST REGRESSION LIST 1

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	ETA
T11	SELF CONCEPT SCALE--PRE	0.62144	0.38619	0.38619	0.62144	0.55745	0.52385
T15	VERBAL ABILITY	0.62195	0.38682	0.00063	0.27102	-0.00809	-0.00877
T46	LEVEL OF IMPLEMENTATION	0.63023	0.39719	0.01036	0.08745	0.73357	0.07716
T21	SOCIAL CLIMATE SCALE--CLARITY	0.66561	0.47034	0.07315	0.41518	0.62191	0.25843
T47	TARGET DUMMY	0.66560	0.47041	0.00007	-0.04153	-0.10025	-0.00618
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.69383	0.48140	0.01100	-0.26350	-0.19543	-0.10557
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.69605	0.48448	0.00308	-0.30065	-0.15818	-0.06353
(CONSTANT)						15.85896	

REGRESSION ANALYSES
REGRESSION ON SELF CONCEPT SCALE--POST: GRADE 6

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
DEPENDENT VARIABLE.. T12 SELF CONCEPT SCALE--POST REGRESSION LIST 2

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSC CHANGE	SIMPLE R	B	BETA
T11	SELF CONCEPT SCALE--PRE	0.66663	0.44440	0.44440	0.66662	0.45450	0.58066
T15	VERBAL ABILITY	0.67242	0.45282	0.00842	0.33446	0.05142	0.06495
T46	LEVEL OF IMPLEMENTATION	0.67401	0.46105	0.00823	-0.14001	-0.88310	-0.11691
T47	TARGET DUMMY	0.67421	0.46135	0.00026	0.05124	-0.01873	0.00131
T21	SOCIAL CLIMATE SCALE--CLARITY	0.70570	0.49801	0.03666	0.35405	0.41315	0.20275
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.70702	0.50073	0.00273	0.14633	0.10825	0.06536
T23	SOCIAL CLIMATE SCALE--PAC	0.70703	0.50102	0.00025	0.01870	-0.04664	-0.02274
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.70804	0.50133	0.00031	-0.20776	0.04913	0.02346
(CONSTANT)						15.22750	

REGRESSION ANALYSES
 REGRESSION ON SELF CONCEPT --POST: GRADE 4

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
 REGRESSION LIST 2
 DEPENDENT VARIABLE.. T14 SELF CONCEPT--POST

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T13	SELF CONCEPT--PRE	0.53924	0.29078	0.29078	0.53924	0.48756	0.44671
T15	VEPEAL ABILITY	0.57512	0.33076	0.03998	0.36417	0.35042	0.18708
T46	LEVEL OF IMPLEMENTATION	0.59622	0.35548	0.02471	0.04173	2.39159	0.16308
T47	TARGET DUMMY	0.59678	0.35615	0.00067	0.01416	0.48658	0.01704
T21	SOCIAL CLIMATE SCALE--CLARITY	0.62862	0.35516	0.03901	0.39427	0.89701	0.22603
T23	SOCIAL CLIMATE SCALE--FACE	0.63052	0.39756	0.00240	0.02086	-0.22747	-0.05462
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.63086	0.39799	0.00043	-0.23147	0.09502	0.02611
(CONSTANT)						4.63689	

G-18

REGRESSION ANALYSES
REGRESSION ON SELF CONCEPT --POST: GRADE 5

***** MULTIPLE REGRESSION ***** VARIABLE LIST 3
DEPENDENT VARIABLE.. T14 SELF CONCEPT--POST REGRESSION LIST 1

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	ETA
T13	SELF CONCEPT--PRE	0.56867	0.32361	0.32361	0.56867	0.45988	0.52346
T15	VERBAL ABILITY	0.57491	0.33053	0.00692	0.27856	0.09346	0.05707
T46	LEVEL OF IMPLEMENTATION	0.57495	0.33057	0.00004	0.00049	-0.02943	-0.00174
T21	SOCIAL CLIMATE SCALE--CLARITY	0.59769	0.35724	0.02667	0.21977	0.65413	0.15217
T47	TARGET DUMMY	0.59780	0.35736	0.00013	-0.05898	-0.04138	-0.00142
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.60732	0.36884	0.01148	-0.19686	-0.43092	-0.13146
T23	SOCIAL CLIMATE SCALE--PACE	0.60976	0.37180	0.00296	-0.13598	0.26894	0.06492
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.61124	0.37361	0.00181	-0.19760	-0.21925	-0.04264
(CONSTANT)						20.92225	

REGRESSION ANALYSES
REGRESSION ON SELF CONCEPT --POST: GRADE 6

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
DEPENDENT VARIABLE.. T14 SELF CONCEPT--POST REGRESSION LIST 2

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T13	SELF CONCEPT--PRE	0.63716	0.40598	0.40598	0.63716	0.52429	0.52506
T15	VEREAL ABILITY	0.66152	0.43761	0.03163	0.43796	0.27523	0.17827
T47	TARGET DUMMY	0.66792	0.44612	0.00851	-0.02474	-2.95065	-0.10626
T48	LEVEL OF IMPLEMENTATION	0.66859	0.44701	0.00086	-0.06365	-0.02010	-0.00137
T21	SOCIAL CLIMATE SCALE--CLARITY	0.68190	0.46498	0.01796	0.21885	0.45736	0.12518
T23	SOCIAL CLIMATE SCALE--PACE	0.68655	0.47135	0.00637	0.09591	0.22520	0.05636
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.68753	0.47270	0.00135	0.16245	0.15935	0.04936
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.68756	0.47274	0.00004	-0.17664	-0.03465	-0.00858
(CONSTANT)						1.61626	

REGRESSION ANALYSES
REGRESSION ON ATTITUDE TOWARD TEACHER--POST: GRADE 4

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST 1
DEPENDENT VARIABLE.. T4 ATTITUDE TOWARD TEACHER--POST

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T3	ATTITUDE TOWARD TEACHER--PRE	0.36071	0.13011	0.13011	0.36071	0.34744	0.28784
T15	VERBAL ABILITY	0.37054	0.13760	0.00748	-0.02585	-0.22383	-0.25477
T47	TARGET DUMMY	0.37200	0.13838	0.00379	-0.03161	-0.09219	-0.00686
T12	SELF CONCEPT SCALE--POST	0.44906	0.20100	0.06327	0.28298	0.16427	0.22654
T48	LEVEL OF IMPLEMENTATION	0.45510	0.20530	0.00364	-0.06998	-0.34887	-0.00344
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.47221	0.22243	0.01758	0.18451	0.21248	0.14018
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.48909	0.23921	0.01623	-0.22049	-0.20052	-0.11746
T21	SOCIAL CLIMATE SCALE--CLARITY	0.49005	0.24019	0.00098	0.23226	0.08049	0.04335
T23	SOCIAL CLIMATE SCALE--PACE	0.49047	0.24056	0.00037	-0.02162	-0.041	-0.02136
(CONSTANT)						12.4668.	

REGRESSION ANALYSES
REGRESSION ON ATTITUDE TOWARD TEACHER--POST: GRADE 5

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
DEPENDENT VARIABLE.. T4 ATTITUDE TOWARD TEACHER--POST REGRESSION LIST 1

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T3	ATTITUDE TOWARD TEACHER--PRE	0.52888	0.27971	0.27971	0.52888	0.55103	0.49926
T15	VERBAL ABILITY	0.52925	0.28010	0.00039	0.06859	-0.02874	-0.04439
T48	LEVEL OF IMPLEMENTATION	0.54858	0.30093	0.02083	0.13336	0.83271	0.12456
T12	SELF CONCEPT SCALE--POST	0.58016	0.33659	0.03565	0.27104	0.11815	0.16411
T47	TARGET DUMMY	0.58026	0.33670	0.00011	-0.01341	0.06390	0.00534
T21	SOCIAL CLIMATE SCALE--CLARITY	0.58941	0.34741	0.01071	0.25347	0.20163	0.11863
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.59026	0.34840	0.00099	-0.02726	0.04157	0.03209
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.59052	0.34872	0.00032	-0.12353	0.03615	0.02028
(CONSTANT)						-1.23128	

G-22

355

354

REGRESSION ANALYSES
REGRESSION ON ATTITUDE TOWARD TEACHER--POST: GRADE 6

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
DEPENDENT VARIABLE.. T4 ATTITUDE TOWARD TEACHER--POST REGRESSION LIST 1

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T3	ATTITUDE TOWARD TEACHER--PRE	0.24189	0.05851	0.05851	0.24189	0.26127	0.21243
T15	VERBAL ABILITY	0.25282	0.06392	0.00540	-0.04183	-0.12740	-0.17566
T48	LEVEL OF IMPLEMENTATION	0.28841	0.08318	0.01927	-0.15010	-0.12557	-0.09581
T47	TARGET DUMMY	0.30246	0.09148	0.00830	-0.09403	-1.04348	-0.08454
T12	SELF CONCEPT SCALE--POST	0.37391	0.13901	0.04832	0.22358	0.19008	0.21954
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.41537	0.17455	0.03273	-0.23830	-0.41540	-0.22933
T21	SOCIAL CLIMATE SCALE--CLARITY	0.41736	0.17619	0.00165	0.14133	-0.10866	-0.06160
T23	SOCIAL CLIMATE SCALE--PACE	0.41898	0.17555	0.00136	-0.01416	0.06341	0.03851
(CONSTANT)						26.36915	

G-23

REGRESSION ANALYSES
REGRESSION ON ATTITUDE TOWARD SOCIAL STUDIES--POST: GRADE 4

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
DEPENDENT VARIABLE.. T10 ATTITUDE TOWARD SOCIAL STUDIES--POST REGRESSION LIST 1

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T9	ATTITUDE TOWARD SOCIAL STUDIES--PRE	0.20361	0.04154	0.04154	0.20381	0.15127	0.13564
T15	VERBAL ABILITY	0.25368	0.06435	0.02282	0.14927	-0.08821	-0.11475
T47	TARGET DLMV	0.25666	0.06587	0.00152	0.06682	1.05538	0.08674
T48	LEVEL OF IMPLEMENTATION	0.25690	0.06600	0.00013	-0.02147	-0.28973	-0.04787
T21	SOCIAL CLIMATE SCALE--CLARITY	0.45377	0.20590	0.13990	0.42301	0.36578	0.22452
T12	SELF CONCEPT SCALE--PEST	0.51356	0.26374	0.05784	0.40273	0.18925	0.29830
T23	SOCIAL CLIMATE SCALE--FACE	0.52509	0.27572	0.01197	0.06817	0.18765	0.10952
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.53168	0.28268	0.00697	-0.33214	-0.15282	-0.10225
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.53508	0.28631	0.00363	0.18410	0.08810	0.06642
(CONSTANT)						0.98923	

G-24

REGRESSION ANALYSES
REGRESSION ON ATTITUDE TOWARD SOCIAL STUDIES--POST: GRADE 5

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST 1

DEPENDENT VARIABLE.. T10 ATTITUDE TOWARD SOCIAL STUDIES--POST

SUPMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T9	ATTITUDE TOWARD SOCIAL STUDIES--PRE	0.44750	0.20026	0.20026	0.44750	0.52616	0.43323
T15	VERBAL ABILITY	0.45528	0.20728	0.00702	-0.06869	-0.11737	-0.17282
T48	LEVEL OF INTELLIGENCE	0.50305	0.25306	0.04578	0.16257	1.43376	0.20447
T47	TARGET DUMMY	0.50873	0.25881	0.00575	0.10029	0.82821	0.06920
T21	SOCIAL CLIMATE SCALE--CLARITY	0.54632	0.34377	0.08496	0.34754	0.35383	0.22092
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.60831	0.37004	0.02627	-0.27745	-0.33894	-0.18132
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.60916	0.37107	0.00103	0.00734	-0.04800	-0.03532
T12	SELF CONCEPT SCALE--PEST	0.60922	0.37115	0.00008	0.15515	-0.00778	-0.01031
(CONSTANT)						10.16999	

G-25

REGRESSION ANALYSES
 REGRESSION ON ATTITUDE TOWARD SOCIAL STUDIES--POST: GRADE 6

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
 REGRESSION LIST 1

DEPENDENT VARIABLE.. T10 ATTITUDE TOWARD SOCIAL STUDIES--POST

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T9	ATTITUDE TOWARD SOCIAL STUDIES--PRE	0.50799	0.25805	0.25805	0.50799	0.34276	0.23303
T15	VERBAL ABILITY	0.51004	0.26014	0.00209	-0.01500	-0.09724	-0.14887
T48	LEVEL OF IMPLEMENTATION	0.51844	0.26878	0.00863	-0.17132	-0.99023	-0.15850
T47	TARGET DUMMY	0.52362	0.27418	0.00540	0.10117	0.74256	0.06313
T21	SOCIAL CLIMATE SCALE--CLARITY	0.62637	0.39234	0.11816	0.47328	0.47132	0.28036
T23	SOCIAL CLIMATE SCALE--PACE	0.64675	0.42087	0.02853	0.19408	0.30000	0.17725
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.65671	0.43127	0.01040	-0.33977	-0.24431	-0.14154
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.65751	0.43206	0.00075	0.20068	0.04712	0.03445
T12	SELF CONCEPT SCALE--FCST	0.65767	0.43253	0.00047	0.21833	0.02046	0.02475
(CONSTANT)						3.08322	

REGRESSION ANALYSES
REGRESSION ON ATTITUDE TOWARD LEARNING--POST: GRADE 4

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST 1
DEPENDENT VARIABLE.. T8 ATTITUDE TOWARD LEARNING--POST

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T7	ATTITUDE TOWARD LEARNING--PKE	0.46502	0.21624	0.21624	0.46502	0.28883	0.28492
T15	VERBAL ABILITY	0.46511	0.21633	0.00005	0.08534	-0.13635	-0.23675
T48	LEVEL OF IMPLEMENTATION	0.46960	0.22052	0.00420	0.04430	-0.05524	-0.02100
T47	TARGET DUMMY	0.47163	0.22244	0.00191	-0.00544	0.36872	0.04185
T12	SELF CONCEPT SCALE--FCST	0.62644	0.39242	0.16995	0.53625	0.22905	0.48177
T23	SOCIAL CLIMATE SCALE--PACE	0.63383	0.40175	0.00932	0.04930	0.16557	0.12897
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.64268	0.41304	0.01125	-0.27306	-0.10958	-0.09785
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.64443	0.41528	0.00225	0.05538	-0.05328	-0.05361
T21	SOCIAL CLIMATE SCALE--CLARITY	0.64567	0.41689	0.00161	0.36253	0.06547	0.05364
(CONSTANT)						5.85828	

REGRESSION ANALYSES
REGRESSION ON ATTITUDE TOWARD LEARNING--POST: GRADE 5

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST 1

DEPENDENT VARIABLE.. TB ATTITUDE TOWARD LEARNING--POST

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T7	ATTITUDE TOWARD LEARNING--PRE	0.50729	0.25734	0.25734	0.50729	0.46896	0.48019
T15	VERBAL ABILITY	0.50760	0.25766	0.00032	0.07432	-0.04769	-0.09801
T46	LEVEL OF IMPLEMANTATION	0.52076	0.27119	0.01353	0.10672	0.68781	0.12696
T47	TARGET DUMMY	0.52082	0.27125	0.00006	0.00682	0.02690	0.00436
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.57803	0.33411	0.06286	-0.26953	-0.27294	-0.20378
T12	SELF CONCEPT SCALE--FCST	0.59641	0.35571	0.02155	0.32240	0.07998	0.14782
T23	SOCIAL CLIMATE SCALE--FACE	0.60486	0.36586	0.01015	-0.04289	0.14768	0.12366
T21	SOCIAL CLIMATE SCALE--CLARITY	0.60745	0.36899	0.00313	0.26182	0.09300	0.07281
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.60877	0.37060	0.00160	-0.07264	-0.04430	-0.04556
(CONSTANT)						10.55626	

REGRESSION ANALYSES
REGRESSION ON ATTITUDE TOWARD LEARNING--POST: GRADE 6

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST 1

DEPENDENT VARIABLE.. T8 ATTITUDE TOWARD LEARNING--POST

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANCE	SIMPLE R	B	BETA
T7	ATTITUDE TOWARD LEARNING--PRE	0.52841	0.27922	0.27922	0.52841	0.44022	0.46254
T15	VERBAL ABILITY	0.53176	0.28277	0.00355	0.00822	-0.06810	-0.15606
T46	LEVEL OF IMPLEMENTATION	0.53513	0.28637	0.00360	-0.08453	-0.21778	-0.05231
T47	TARGET DUMMY	0.53607	0.28801	0.00164	0.00718	-0.39007	-0.04564
T12	SELF CONCEPT SCALE--POST	0.58154	0.33819	0.05018	0.32183	0.16647	0.19315
T21	SOCIAL CLIMATE SCALE--CLARITY	0.60326	0.36395	0.02576	0.30216	0.18474	0.16448
T23	SOCIAL CLIMATE SCALE--PACE	0.60416	0.36500	0.00105	0.08406	0.04069	0.03599
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.60428	0.36516	0.00015	-0.18905	-0.01875	-0.01626
(CONSTANT)						4.80235	

REGRESSION ANALYSES
REGRESSION ON ATTITUDE TOWARD SCHOOL--POST: GRADE 4

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST 1

DEPENDENT VARIABLE.. T6 ATTITUDE TOWARD SCHOOL--POST

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	ASC CHANGE	SIMPLE R	B	BETA
T5	ATTITUDE TOWARD SCHOOL--PRE	0.30202	0.31929	0.31929	0.56505	0.54747	0.51626
T15	VERBAL ABILITY	0.57665	0.33252	0.01324	-0.13299	-0.37101	-0.29031
T47	TARGET DUMMY	0.57950	0.33582	0.00330	0.01148	-0.01105	-0.00057
T48	LEVEL OF IMPLEMENTATION	0.57977	0.33613	0.00031	-0.00298	-0.33803	-0.08220
T12	SELF CONCEPT SCALE--POST	0.65914	0.43533	0.09919	0.29202	0.39525	0.27848
T23	SOCIAL CLIMATE SCALE--FACE	0.66202	0.43927	0.00299	-0.02349	0.16423	0.05768
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.66257	0.43874	0.00047	-0.05049	0.06609	0.02660
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.66258	0.43901	0.00027	0.04584	-0.04019	-0.01822
T21	SOCIAL CLIMATE SCALE--CLARITY	0.66261	0.43905	0.00004	0.17460	0.02314	0.00854
(CONSTANT)						-6.65751	

REGRESSION ANALYSES
REGRESSION ON ATTITUDE TOWARD SCHOOL--POST: GRADE 5

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
REGRESSION LIST 1
DEPENDENT VARIABLE.. T6 ATTITUDE TOWARD SCHOOL--POST

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA
T5	ATTITUDE TOWARD SCHOOL--PRE	0.66956	0.44831	0.44831	0.66956	0.67123	0.63200
T15	VERBAL ABILITY	0.66964	0.44841	0.00010	-0.03303	-0.06973	-0.09211
T48	LEVEL OF IMPLEMENTATION	0.67597	0.46236	0.01395	0.07621	1.05786	0.10515
T47	TARGET DUMMY	0.68002	0.46242	0.00006	0.01437	-0.16639	-0.01086
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.75546	0.53797	0.07555	-0.25964	-0.45844	-0.18586
T21	SOCIAL CLIMATE SCALE--CLARITY	0.75117	0.56425	0.02628	0.31894	0.38345	0.14595
T12	SELF CONCEPT SCALE--POST	0.75703	0.57310	0.00885	0.27844	0.11593	0.10703
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.75726	0.57344	0.00034	-0.10435	-0.03242	-0.01663
T23	SOCIAL CLIMATE SCALE--PACE	0.75729	0.57349	0.00005	-0.09750	-0.01940	-0.00611
(CONSTANT)						4.94436	

REGRESSION ANALYSES
 REGRESSION ON ATTITUDE TOWARD SCHOOL--POST: GRADE 6

***** MULTIPLE REGRESSION ***** VARIABLE LIST 1
 REGRESSION LIST 1

DEPENDENT VARIABLE.. T6 ATTITUDE TOWARD SCHOOL--POST

SUMMARY TABLE

VARIABLE		MULTIPLE R	R SQUARE	RSC CHANGE	SIMPLE R	R	ETA
T5	ATTITUDE TOWARD SCHOOL--PRE	0.51567	0.26592	0.26592	0.51567	0.40886	0.42584
T15	VERBAL ABILITY	0.52411	0.27470	0.00878	-0.03850	-0.16282	-0.20241
T46	LEVEL OF IMPLEMENTATION	0.52652	0.27723	0.00253	-0.00257	0.23522	0.02725
T47	TARGET DUMMY	0.52660	0.27737	0.00015	0.03618	-0.25127	-0.01545
T12	SELF CONCEPT SCALE--FCST	0.59320	0.35185	0.07452	0.33791	0.29501	0.25556
T20	SOCIAL CLIMATE SCALE--DIVERSITY	0.61720	0.37771	0.02582	0.30565	0.26767	0.14168
T22	SOCIAL CLIMATE SCALE--SIMPLICITY	0.62206	0.38696	0.00925	-0.13546	-0.21264	-0.08506
T23	SOCIAL CLIMATE SCALE--FACE	0.62435	0.38986	0.00290	0.19471	0.15845	0.06772
T21	SOCIAL CLIMATE SCALE--CLARITY	0.62476	0.39032	0.00046	0.25183	0.07052	0.03032
(CONSTANT)						-3.72462	